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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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Co-Operation in Utilizing Surplus Power.

THE encouragement of the local press in relation to utilizing surplus power is a good thing for any central-station organization to secure, and where this co-operative spirit comes to the front voluntarily, all the better. Not long since a hydroelectric development was carried out in the vicinity of a prosperous Eastern city in the belief that the demand for power from this important natural resource would be sufficient to pay a fair return upon the cost of the undertaking. The community appeared rather slow, however, to appreciate the value of the new service, and as a result the principal local daily took up the matter editorially.

The paper pointed out that capitalists are spending large sums in hydroelectric development in different parts of the country, and that as a rule these undertakings are constructed by men having the necessary imagination to pierce the future and foresee how new enterprises will utilize the product of their plants. The editor showed his readers "that men put their cash into projects of this character because they hope to see other dollars returning to them in the shape of dividends, as they have a right to expect." Turning to the local situation, the writer called attention to the fact that the recently inaugurated local hydroelectric development of the central-station system in the city, a few miles outside town, needed business to enable its projectors to realize their expectations. It was pointed out that surplus power was going to waste at the plant to a degree that was a reproach, either to the men behind the project, to the citizens of the communities concerned or to both.

The discussion closed with the suggestion that the "go-ahead people" of the city get together with the local light and power company and help to utilize the surplus power available in the development of industries somewhere within the region that will employ skilled workers. The writer emphasized the point that it was by no means necessary under the conditions to locate the industry within a stone's throw of the business center of the town, stating, in fact, that it could be located anywhere within easy radius of transmission from the station where land is cheap. Finally, the editorial touched upon the desirability of adding the new establishments' workers to the population of the urban and suburban community concerned, since the employees would then become taxpayers and consumers as well as producers, and would help both the municipalities in the district and the power company alike.

Such an utterance by the editor of an influential local daily in a city of even fair size bespeaks a most satisfactory appreciation of the value of co-operation between public utilities and the press. We have referred to it at some length because it is a refreshing contrast to the attacks on public utilities which even sober and reputed high-class papers sometimes are betrayed into. Such an attitude shows a most commendable recognition of the unity of interest between the utility and the public, and gives a touch of constructive suggestion to a situation that may be materially helped by sympathetic publicity.

Rate Reductions in Long-Term Street-Lighting Contracts

THE question whether unit street-lighting rates may equitably be lower on a long-term contract is one of considerable interest in comparison with the rates offered on an agreement of, say, but from one to three years. A five-year contract, to be sure, cannot be considered one of the long-term variety; but as opinion moves today, a 10-year agreement fairly comes within this classification, and of course anything extending beyond a decade falls into line without question. We have heard the issue raised more than once, however, as to the so-called injustice of a central-station company's offering a discount from the base price per lamp in case the municipality will agree to take service over a more or less extended period above one year, the discount being the greater with the length of the proposed contract.

It ought not to be difficult to convince both the municipal authorities and the public utility boards that a lower price on a longer-term contract is entirely fair, not only to the company but to the public. Somehow it is easy to overlook the fact that a very substantial investment is required to supply modern street lighting on the series plan, and that this investment is of a nature to be utterly useless in large part for any other service on the system. Unlike the power and

commercial lighting lines, the series distribution circuits of a modern street-lighting installation are unavailable for day loads of diversified character. Now if this investment, which is in use perhaps less than half the total hours in a year and absolutely idle the balance of the time, must be carried by a company with the uncertainty that it may not be available within the near future on account of municipal lighting possibilities, it is clear enough that a higher rate is justified on a short-term contract than on a longer one, other things being equal. It may be argued that if the city or town takes over the street lighting, it will probably take over the lines and lamps and poles used in that particular service. Such action is probable, but it is not assured unless agreed upon in the contract or required by existing legislation bearing upon condemnation proceedings. And even if the lines and other external plant relating to street illumination are taken over, or may be so handled, there remains a not inconsiderable investment in specialized interior station or substation equipment which the public utility may have on its hands at the expiration of the contract, provided no extension is made in the life of the service.

With the passage of time, the progressive community is sure to install more and more street lamps, and if the type remains substantially unchanged, it still becomes relatively less expensive to supply these with increasing numbers. Again, if the type is changed and improved units are substituted or added, the company finds itself in a position to render a better service for a given outlay, and hence there is fair ground for offering a lower rate for an extended period of supply than on a very short-term agreement. It is true that the load-factor of the street lighting service, while it is on, and taken by itself is excellent; but this is not so good a reason as perhaps it used to be for claiming lower rates. Progressive operating companies are getting rapidly away from the extreme peaks of lighting above power demand which used to be so commonly found in load-curve plots, and the growth of commercial electric service is on the whole vastly greater in proportion to the size of the municipality than the development of street lighting. On a very large system, the street lighting load is not much more than a cupful in the bucket, so to speak, when expressed in momentary kilowatts demand compared with the power and commercial energy output at a given moment of the day as a whole. If the parties making an agreement wish to provide for a sliding scale of street lighting rates depending upon the rate of extending the service, well and good; but surely the certainty of continuous patronage has a commercial value which should be reflected in the bargain between the public and the utility.

A manufacturer who puts in an expensive plant to furnish a commodity to steady purchasers on long-time contracts can offer a lower price than where the purchasers are likely to cease abruptly. The same holds in furnishing street lighting.

Electricity in Agriculture

IT HAS been suggested here on several occasions that the increased attention that the incidents of war have drawn to the important subject of food cultivation in England would increase greatly the prospects for the use of electricity in connection with agriculture. We have good reason for knowing that the practical interest taken in the subject by central-station engineers and by farmers in many parts of the British Isles has increased considerably during the past month or two and the outlook for the immediate future is most encouraging. In addition to separate experimental and practical operations that are being proceeded with in several places, some by private parties and in one important case by the government, concerted action is to be taken by engineers and managers to accelerate the rate of such development. The Incorporated Municipal Electrical Association, which did so much in earlier days to give a boosting influence to heating and cooking business, and in later times to encourage the use of electric vehicles, has now taken strong agricultural action. It announces that it recognizes the important part that electricity can be made to play in the better cultivation and greater production of the land and in the extension of rural industries, and has accordingly formed the nucleus of what is intended to be a committee representative of all interests concerned, with the object of a thorough investigation into the technical and commercial problems underlying the application of electrical energy for such purposes. The committee will be known as "The Committee on the Development of Electricity in Agricultural Areas Formed by the I. M. E. A."

There are already formed subcommittees to deal with publicity and technical matters. The work set for the committee will be as follows: To investigate and advise upon the problems underlying the supply and use of electrical energy in agricultural areas for power, lighting, heating, culture and other purposes for farms, villages and rural industries; to collect and collate information and published literature bearing thereupon; to co-operate with agricultural and other associations; to investigate in co-operation with manufacturers the development, manufacture and adaptation of agricultural machinery and appliances for utilizing electrical energy; to promote the exhibition of such machinery and appliances at agricultural shows and elsewhere; to offer assistance in arranging demonstrations and lectures in conjunction with farmers associations, clubs, etc.; and to promote any legislation necessary to facilitate the application of electrical energy to agricultural areas. It is the intention of this committee in the furtherance of this very enterprising program, to formulate definite proposals for consideration and discussion and compile necessary data and information, after which it will invite kindred bodies to nominate representatives to sit in its councils.

HAPPENINGS IN THE INDUSTRY

Electric-Furnace Problems Discussed by Electrochemical Society--- Cost for Portland Municipal Plant Too High---Report of N. E. L. A. Convention and Abstracts of Reports and Papers

ELECTRIC-FURNACE PROBLEMS DISCUSSED.

Electric Steel Making and Allied Topics Discussed by American Electrochemical Society at Annual Convention.

Electric furnaces and steel-making was fully discussed at the thirty-first general meeting of the American Electrochemical Society, which was held at the Hotel Statler, Detroit, Mich., May 2, 4 and 5, 1917. There was a very good attendance of the members and the interest in the meeting was well sustained. The secretary's report showed that 250 new members had been secured since the last meeting, making the total membership above 1,600. The report of the treasurer showed the Society in a very sound financial condition. President F. A. J. FitzGerald in his opening address said that the creation of the Committee on Public Relations by the American Electrochemical Society is a symptom of the growing consciousness of the duty of individuals and their numerous groupings to the democracy to which they belong. This growth has been greatly stimulated by the struggle of the great war between democracy and another form of government which is characterized by a far higher efficiency according to its exponents. How, then, can a social group like our Society serve in strengthening that form of government which we consider necessary to preserve the rights of life, liberty and the pursuit of happiness?

The committee in an attempt to answer this question by dealing with public questions referred to the Society, with subjects on which advice is asked by the Government. The committee should study subjects of public interest related to electrochemistry and initiate action on these by the Society or its members. The committee should also try to educate the public in a proper appreciation of expert advice. This valuation of expert advice is lacking in democracies.

The technical man should not try to be a politician, but should realize that he must play a complementary part to the politician, who is just as important in his own sphere of activities. Let us then remember that no matter what advances we make towards the development of new processes and inventions we are only doing half of our duty, and cannot in justice pose as benefactors of humanity, unless we also do our part in seeing to it that the results of our labors are so wisely employed that they will prove to be blessings rather than a curse.

Water-Power Legislation.

The report of the Committee on Water-Power Legislation, read by the secretary, stated that most of the important electrochemical industries are absolutely dependent on an abundance of cheap power, and at the present time are suffering from an extreme shortage of such power, which makes them unable to supply the urgent demands upon them, a condition which is very detrimental to the manufacture of products of vital necessity to the country. In view of this fact the American Electrochemical Society believes that no legislation affecting water-power should be enacted without giving a careful hearing to the electrochemists of the country.

The Electric-Steel Industry.

The first paper presented was "Comments on the Electrical Steel Industry" by John A. Matthews. This paper presents a review of the inception of the industry, its early development and its present achievements. Electric-steel using molten charges from an open-hearth furnace can be made of as good quality as from a cold charge. It also saves oxidizable ingredients, such as chromium, which are lost when remelting in open-hearth furnaces. Other advantages are discussed. The present electric steel capacity of the United States is eight times that of the crucible steel production and one-eighth that of Bessemer steel.

J. L. Dixon, in discussing this paper, said that the Sheffield steel maker is very keen on what he calls "body" in the steel, and holds that the chemical analysis of the steel is of very little value as a guide to its quality. While the chemical analysis has to be given, it is the opinion of the Sheffield steel maker that it does not follow that the steel is good if that is good. The best practice is to melt the puddled cemented bar and then put into the furnace the charcoal and then heat it and absorb the carbon and melt the crystals.

Charles F. Linsay mentioned that the British Government is installing at Toronto, Canada, the largest electric-steel plant in the world so far as he knew. There are to be ten six-ton Heroult furnaces, with cold melt, which will give about 400 tons per day of electric-steel ingots.

Robert Turnbull stated that the electric furnace can melt cheaper and better than any class of furnace except the basic open-hearth furnace. This is owing to the cost of the raw material employed in the process. In the acid open-hearth furnace the steel scrap is at a high figure. The low phosphorous scrap is running at $75 per ton, whereas in the electric furnace the cheapest kind of scrap can be used, and to a great extent better than in any other furnace, so that today the raw material being used in the electric furnace can be a mixture of 50-per-cent turnings and 50-per-cent heavy metal, and the scrap in the United States would run somewhere around $18 a ton.

Electric Furnace for Steel-Casting Plants.

R. F. Flintermann then read a paper on "The Electric Furnace in the Steel-Casting Plant." This paper covered the advantages possessed by the electric furnace for the production of small steel castings over both the crucible and side blown converter processes. The principal advantage consists in better physical qualities and adaptability for production of heat-treated and alloy castings.

G. P. Fuller asked as to the yielding point, or ultimate strength, of a casting described, which had 36 per cent elongation, to which the author replied that the maximum on a 25 carbon, running 60,000 to 65,000 compound, would average pretty close to 60 per cent.

Prof. E. D. Campbell, being asked to discuss the paper, said that he had been contending for a good many years that the constitution of steel is practically a study in solubilities;

that certain compounds will be soluble in steel, and others will be insoluble, and one question that was considered was the solubility of slag in the true sense of solubility, and that possibly a basic slag, a basic compound, which differs even very decidedly in physical properties and solubilities from the acid one, might be more soluble in steel than the acid slag. That was the underlying idea, that in a basic furnace, either basic open-hearth or the electric furnace, the slag itself as such might be in part in solution, and the other part good solid steel, whereas the acid steel would be slightly, if at all, soluble, in the ordinary sense of the word, distinguished clearly between the chemical suspension when you have an open base furnace, and the acid slag is burned up with the material, that is merely mechanical suspension, that slag can be removed by quietly standing and floating on the surface. That would be a different phenomenon from true solubility.

Electric Steel Melting.

The next paper was "Notes on Electric Steel Melting" by J. L. Dixon. This paper presents a discussion of the details of construction of the furnace, the electrical factors which must be considered, the thermal considerations which affect the efficiency and the deterioration of the furnace, and the chemical reactions which eliminate sulphur from the steel and deoxidize the bath. The discussion is based on several years' practical experience.

Robert Turnbull, in the discussion, said for a long time the industry had been wedded to copper for the electrode contacts, supporting devices, etc., but he believed in the future all electrode holders would be made of cast steel. These have been in use for more than a year at the plant with which he is connected and they have given no trouble.

John A. Seede remarked that the automatic control for the ordinary electric furnace has a lot of work to do, and he considered the results secured with the various controls as very satisfactory. The average load curve in the electric furnace throughout the day, compared with the load that is secured with an ordinary machine-shop motor, is so much better that he could not see how the average central-station man could have any protest at all.

E. C. Stone stated the reason the central-station man complained of the fluctuations of the electric furnace is not so much the percentage of fluctuation as the fact that the ordinary furnace is very much larger than the ordinary motor. They have a number of electric furnaces on their system and they find in every case it is necessary for them to completely isolate the electric-furnace installation from the rest of the system.

Bethlehem 10-Ton Furnace.

A paper entitled "The Bethlehem 10-Ton Girod Steel Furnace," by C. A. Buck, was read by the secretary.

Bruce I. Whiting, in reply to a question, said that the magnetic circle of the control in the furnace is broken up by a non-magnetic territory, either copper, brass, silica steel or manganese steel, although manganese steel is hard to work. Any material that is non-magnetic can be used for the purpose. The installation of the column over the shell to prevent short-circuit is made by mica insulation, and that is also placed in the roof of the shell, to prevent any possible short circuit through there, in case the roof becomes sufficiently hot to become conducting.

Characteristics of Electric Furnaces.

Next followed the paper "Electrical Characteristics of Electric Furnaces" by A. A. Meyer. This paper comprises an electrical investigation of a Heroult and of a Grönwall electric steel furnace, covering their construction, operation, load fluctuations, power-factors, unbalancing effects on the three-phase system and determining of the wave distortion by the oscillograph. The oscillograph data are studied closely, to draw from them deductions as to the self-induction of the furnace and connections. The effect of these considerations on the accuracy of the customer's watt-hour meters is also discussed.

H. M. St. John said that it is definitely proved that we do get rectification in an arc furnace of this type. Three independent investigations have shown that. There may be no surprise that the rectifier appears to reverse in direction, because such rectifier as we have under these conditions is a contact rectifier, and contact rectifiers are notably eccentric and frequently do reverse direction of their operation, without any apparent reason.

Election of Officers.

The newly-elected officers are as follows:

President, C. G. Fink.

Vice-president, H. C. Parmelee.

Second vice-president, C. F. Frary.

Third vice-president, J. W. Beckman.

Managers, L. E. Saunders, J. A. Matthews and A. T. Hinckley, Jr.

Treasurer, Pedro G. Salom.

Secretary, Joseph W. Richards.

The fall meeting is to be held in Pittsburgh.

COST OF PROPOSED MUNICIPAL PLANT FOR PORTLAND, ORE., TOO HIGH.

Report by City Expert Shows New Plant Would Impose Undue Burden on Taxpayers.

City Commissioner Daly, of Portland, Ore., recently proposed to the city council that the city construct a municipal lighting plant which he estimated would cost $1,770,000. He requested that the proposal to issue 20-year, four-per cent bonds of that amount be submitted to the voters at a subsequent election. Pending further consideration of the plan the city council engaged J. L. Stannard, hydroelectric engineer, of Portland, to make an investigation of the proposed project and make a report as to feasibility and cost of such installation. Mr. Stannard's report was submitted to the council on April 27. In this report the estimated cost was placed at $3,391,588, or about $1,614,588 in excess of the original estimate by Mr. Daly and his engineers.

The proposed project contemplates the diversion of water from Bull Run River, 13.5 miles above the site of proposed headworks, and conveying the water in an open wooden flume to a storage reservoir of 4,000,000 cubic feet capacity; and thence by penstocks leading to the proposed power plant on the stream named; then transmitting power by pole line to Portland, a distance of 30 miles. It also provided for the construction of a dam at Bull Run Lake to increase the available supply of water. Mr. Stannard, in his report, deemed an open wooden flume inadvisable on account of danger from forest fires, falling timber and snowslides, and in his cost estimate substituted a wood-stave pipe line for flume, the cost of pipe line being estimated at $233,734 in excess of that of wooden flume. He suggested some changes in the penstock system originally proposed.

As the Bull Run water supply in this identical locality is the source of supply for the city of Portland, the effect of making this supply available for hydroelectric power at the same time was analyzed. It was pointed out that a constant flow of 30,000,000 gallons per 24 hours was essential for the city water system, and that the operating of the generating plant would create a deficiency in rate of supply to city at certain hours of the day, requiring a draft at that time on the reservoir supply. The plan of securing an additional supply for the city system and for proposed electric power plant, by constructing an impounding dam at Bull Run Lake, was discussed, and attention was called to about 200 leaks in the

bed of that lake, and he suggested that no expenditure be made on a dam to raise the level of the lake until after experiments have been made to determine the stability of the basin.

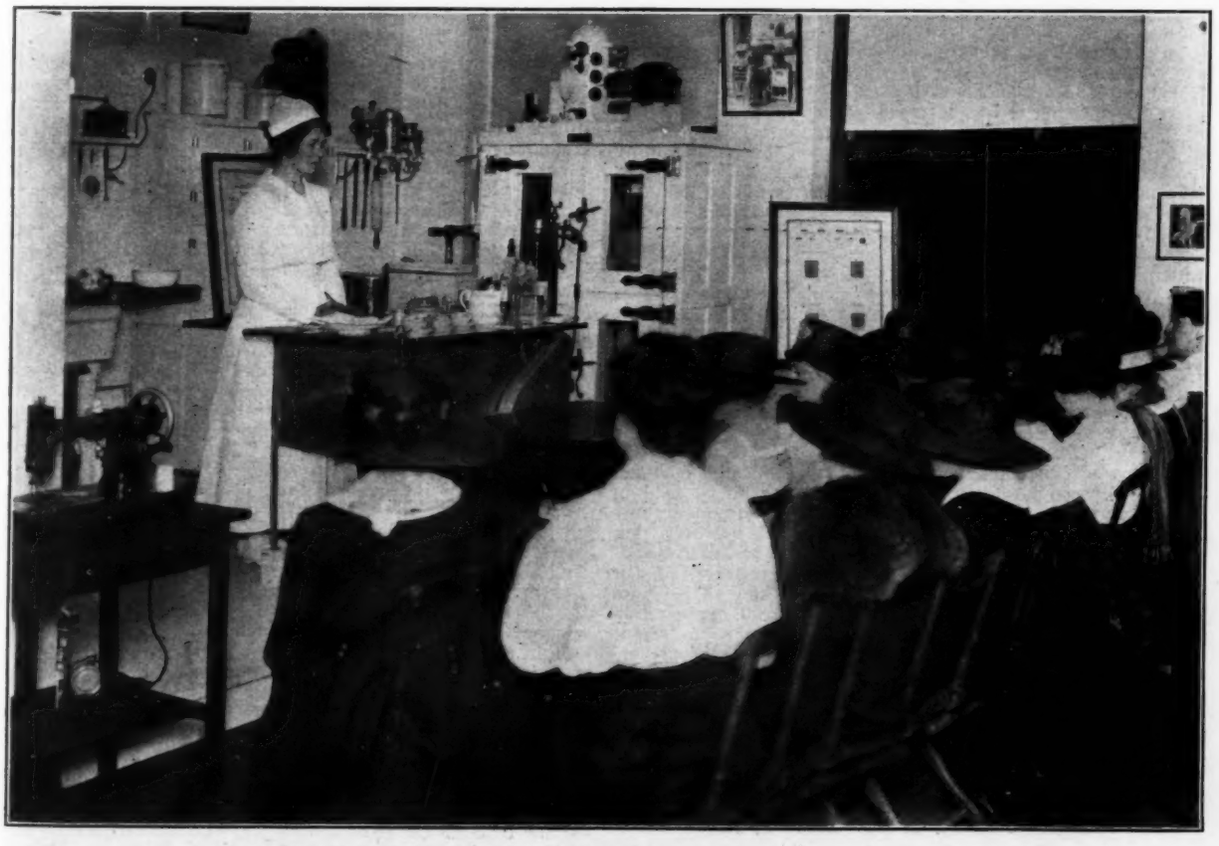
A steam auxiliary plant, also proposed as a part of the project, was estimated at a cost of $379,734, in addition to the cost of project proper. Cost estimates were based upon existing prices of material, equipment and labor. Mr. Stannard's investigations were made in collaboration with those of G. C. Mason and H. L. Bowlby, who had been engaged by other interests. Evidently the cost estimates by Commissioner Daly were based on normal prices instead of those now prevailing. The showing made in Mr. Stannard's report, which was concurred in by Mr. Mason and Mr. Bowlby, will result in deferring the proposal for a bond issue.

MRS. THOMAS A. EDISON HEADS NEW YORK EDISON RED CROSS WORK.

Two Organizations of Central-Station Employees Now in the Field.

Central stations which are planning preparedness work will find the work now being carried on by the New York Edison Company an interesting example after which to pattern their own Red Cross work. The Edison Company now has two very active Red Cross organizations, one of which, conducted under the auspices of the New York Company's Section, N. F. L. A., is known as Auxiliary No. 3 of the American Red Cross, and the other, the New York Edison unit of the American Red Cross. Both of these are under the New York County Chapter. The Auxiliary, which is supported by voluntary contributions from the gas and electric companies, is a practical working organization, and since the day war was declared, has turned out thousands of bandages and surgical dressings. The Edison unit confines its activities entirely to instruction work. Mrs. Thomas A. Edison is honorary chairman of this organization, which has arranged a schedule of courses in dietetics, home care of the sick, surgical dressings, first-aid work for men and first aid work for women. Many of the employees of the New York Edison Company have already enrolled in these courses, which are also open to anyone wishing to take them. The instructors in dietetics are the Misses Mary Pascoe, Margaret A. Butler and Helen M. Curtis; in the home nursing, Miss Grace Woodson; in surgical dressings, Miss Mabel F. Martin; in first aid, Dr. Frank Yoemans, Dr. Edgar Johnson and Dr. Creighton Barker. The Executive Committee consists of the Misses Margaret A. Butler, Frances T. Collet, Helen M. Curtis, Beatrice Danne, Mabel F. Martin, M. A. Gewehr, Mary E. Pascoe, Grace Woodson, Mr. Cyril Nast and Mr. Clarence L. Law. Miss Winifred E. Black is Chairman, Miss Ina J. Zimmer is Secretary and Miss Anne Broome is Treasurer. The classes are held evenings at 124 West 42nd Street.

Kansas City League Participates in Civic Activities.—The Jovian Electric League of Kansas City is finding many things that it can busy itself with for the public good and the advancement of the cause of electricity. At a recent meeting the fact that the big flag, on a 100-foot pole, opposite the Union Station, was invisible at night was commented on. A committee was at once appointed to see to the illumination of this flag. Incidental to this proceeding, the committee will probably try to secure the illumination, in part at least, of the Union Station. This structure, built at a cost of several million dollars, one of the finest in the United States, is almost invisible at night. The League also appointed a committee to investigate the question of city ordinances pertaining to electrical work and equipment, and suggest action that the League might take for the promotion of the best interests of the public and the industry.



New York Edison Class in Dietetics Under Auspices of Red Cross.

National Electric Light Convention

Fortieth Annual Meeting Discusses Vital Problems That Now Confront the Central-Station Industry --- Labor Conditions Most Important---Association Pledges Support to Government

CHARACTERIZED by an attendance of the most important men in the central-station industry and with a seriousness of purpose that reflects the importance of the problems confronting the central-station industry today, the fortieth annual convention of the National Electric Light Association was called to order by President Herbert A. Wagner in the United Engineering Societies Building, New York, at 10:30 a. m. Wednesday, May 9. Vice-President W. F. Wells and Executive Secretary Martin occupied the platform with the president, and there were some 250 members in attendance. The hall was artistically decorated with flowers and a great abundance of flags, and over the speaker's platform large British and French flags were entwined with those of the United States. Early in the proceedings a large United States flag was unfurled to the music of a trumpet and "America" was sung with great earnestness.

PRESIDENT'S ANNUAL ADDRESS.

President Wagner in his annual address said in part: "This fortieth convention of the National Electric Light Association was to have been held at Atlantic City beginning on May 28. All plans had been perfected in every detail for providing for what promised to be one of the largest conventions this Association has held. Unusually good facilities had been secured at considerable construction expense for daily parallel meetings totaling some 25 sessions of the general convention and of its four national sections in four well appointed and quiet meeting rooms on the Million Dollar Pier.

"A manufacturers' exhibit of unusual proportions and character had been arranged for and carried nearly to completion, which was intended to be of great educational value to our members in showing the many uses, and particularly new uses, through which electricity can be of the greatest service to the domestic household, store and factory. The lamp committee was preparing an educational exhibit of lamps and illumination surpassing anything heretofore attempted. It had also been planned to hold a great patriotic and preparedness meeting to be addressed by men of national repute.

"Almost at the last hour, however, the sudden decision of our country to enter the world war, and the realization of the active and important part our country is called upon to take in freeing the world from despotism, made us pause to consider the grave responsibilities of our Association as representing the great public utilities upon which the people are dependent for light and the protection to life and property which it affords, and upon which so many industries, great and small, are dependent for power. In such times as these the best thought of our member companies, the time of their men, and their financial resources should be conserved and devoted to their problems and duties at home.

"After hearing the opinions of many members, and securing the advice of the public policy committee, your president, acting on the authority vested in him by your executive committee to determine upon the place and time for the annual convention, decided, on the 18th of April, to abandon the proposed convention at Atlantic City and call an annual meeting, of comparatively limited attendance, to be held in New York to comply with the requirement of the Constitution.

"There was a strong feeling in my mind, however, that never before has there been a time in the life of this Association when there was greater need for the executives of our member companies to get together to talk and advise with each other on the great problems of industrial organization and co-operation, and particularly with reference to means of assisting the Government now in its great task of preparing for and conducting this country's part in the fearful war we are about to enter.

"To provide the opportunity for such a conference with the least possible delay notices were sent out that these matters would be considered at the newly announced annual meeting, and that the date for its convening would be advanced to May 9 and 10. In two notices following, the last announcing the proposed program of proceedings, the executives of all member companies were urged to attend."

President Wagner then dwelt on Association matters, reviewing the year's substantial progress of the various branches of the organization, the membership campaign, growth of the geographic-section movement, and other important items of Association interest.

PUBLIC UTILITIES AND PREPAREDNESS FOR WAR.

Taking up matters of immediate vital importance, he said: "Throughout this great country, the action of the Government at Washington in declaring its intention to take its place with the Entente Allies in the war against the Central Powers has met with a response most gratifying for the spirit of patriotism and unity exhibited. Whatever doubts and differences had previously existed have been solved or subordinated to the national policy, and when the Government took its final stand upon this ground the country showed a united front.

"The war has now lasted nearly three years, and has become the most awful tragedy of history, overshadowing all other human affairs, and the supreme task of the time is to bring it to an end, if possible, under conditions which will give some assurance against the recurrence of a similar calamity in the future. In this task the United States has now joined, and, until it is accomplished, all energies which can be effectively directed to this end should be so devoted. The Government rightfully has a first call upon all the resources of the country for this purpose, and the steps which it is taking indicate that it intends to organize its forces of men, equipment, and materials as rapidly as possible."

Vice-President Wells appointed as the Committee on the President's address J. B. McCall, of Philadelphia, E. W. Lloyd, of Chicago, and H. H. Scott, of New York.

Secretary Martin in a few words outlined his report, stating that some 2,000 pages of Association addresses were being printed and copies would be sent to the members.

PUBLIC POLICY REPORT.

Chairman W. W. Freeman, of the Public Policy Committee, briefly announced the reasons for the action of the committee in recommending the curtailing of the convention proceedings, and announced that a sub-committee of its members had been appointed to act for the Association in respect to war conditions affecting the electric lighting industry. This committee consists of John W. Lieb, chairman, and Samuel Insull, of Chicago, Charles L. Edgar, of Boston, J. B. McCall, of Philadelphia, and Herbert A. Wagner, of Baltimore.

Mr. Lieb, for the sub-committee, spoke at some length discussing the problem confronting the lighting industry in the present war situation, and stated among other important facts that the electrical industries of Great Britain and Canada had lost to war drafts from 15 to 50 per cent of its working force. The splendid part played by the women of these countries was described and received with applause. As a matter of local interest Mr. Lieb stated the New York Edison Company was now spending $1,000 a day exclusively for guards for its plants, over and above usual expenditure for operation.

Major J. H. Finney, of the Engineers' Reserve Corps, spoke of the work that was being done by the Government and of the help that would be expected from the electric lighting field.

J. E. Aldred, of Montreal and Baltimore, spoke most eloquently and patriotically of what had been done by Canada in the matter of her enlistment (over six per cent of her population having gone to the front) and her sacrifice, and was applauded and cheered when he said if any mistakes were made he wanted to see them made in the direction of generous treatment of those men who went to the firing line.

EFFECT OF ENLISTMENTS DISCUSSED WEDNESDAY AFTERNOON.

The first speaker Wednesday afternoon was Allen Walker of the U. S. Chamber of Commerce, who advised careful consideration of plans to provide for maintaining home industries

as well as to furnish men for the war. He said that experience showed best the results where enlisted men were all on the same plane and taken care of by the Government and not forced by the companies.

J. B. McCall, of Philadelphia, said he was in hearty sympathy with any project the Association adopted for care of dependents of enlisted men, but organization should be effected so that wheels of business should continue. He stated that Philadelphia had paid its men when called to the Mexican border full salaries while absent, but perhaps this was a little hasty. Mr. McCall said further:

"When it came to the declaration of war, however, without any selfish purpose in it, but so that our men would not act hastily, we issued an order that all the men who had been in the national guard, until further notice, would receive their pay minus whatever the allowance was that was made by the Government and that we would not pay anything to the men who enlisted who were not in the guard and that we would endeavor to satisfactorily place them upon their return.

"We have devised a plan which is tentative to the extent that it is definite only to the first of August and we are working on the theory that we shall not pay anything to the man himself who goes to the front, but that we shall provide for the dependents that he leaves at home. In other words, to the single man who goes to the front, we pay nothing. If the man who goes to the front be a married man and childless, we pay to his wife $30 a month. If they have one child, or the prospect of one, we pay $40 a month. If the married couple has more than one child, we pay in addition to the $40 a month, $10 for each additional child. You can see at once that the theory of this is based on the assumption that the dependents should be taken care of, and as the gentleman from the Chamber of Commerce said, the soldier at the front needs no money.

"This plan applies only to men who receive $100 a month or less, because they represent the largest majority of our employees. In addition to what I have already told you, there is a limit on our obligation to the extent that we shall pay to the dependents only an amount which shall equal the difference between what the government pays to a soldier and the man's salary from the company. We have done nothing beyond the first of August. We have done nothing in regard to men who receive over $100 a month, because we expect to treat those cases as special cases."

H. I. Harriman, of Boston, said: "Our company took the position at the start of paying its employees the difference between the government pay and the salary they had previously received. We are now having an investigation made to see in New England what it really costs our various employees to live, and based upon the results of that investigation, we shall make up a list of payments to the wife and the children; that is, to the dependents at home."

The Experience in Canada.

R. H. McDougall, president of the Canadian Electrical Association, said: "Canada, out of its population of about 7,000,000, has enlisted over 414,000 men by voluntary methods. The city of Toronto, where the company I am connected with is located, is a city of about 550,000 population. We have enlisted in that city over 94,000 men, or over 17 per cent of the population. In Canada, the power supply companies have been taxed to their utmost to supply the demands for current for their customers, many of whom are manufacturing munitions of war.

"Our sense of proportion, however, must not be distorted, I am a captain in a regiment in Toronto that has enlisted, trained and sent over 5,000 men to the front. I will not take a back seat to anyone in regard to loyalty to our cause, but I maintain that we have a great many employees who are more necessary in their present position than they are at the front. I also know, however, that we have a percentage of young men in our business who can be spared for the ranks. You, with conscription on a selective basis, should not suffer to the same extent as the Canadian companies. A great many clerical positions formerly occupied by men are being efficiently filled by women. In England, I am told, nearly all meter readers are women, and women have been even used to fire boilers and as substation operators. In my opinion, the central-station industry has more to fear from the loss of men to munitions plants than they have to enlistment. This is largely because of the abnormal rate of wages paid by these plants. In Canada, we have somewhat overcome this danger by paying the men bonuses of 10 per cent or more, which are subject to withdrawal should a man not serve the full pay roll period. These bonuses do not change the rate and are recognized as a war measure. The enlistment results in Canada of some central stations made may be of some interest. A few of them are as follows:

	No. of Employees.	Enlistment.	Per Cent of Employees.
Toronto Electric Light Company.	450	125	28
Toronto Power Company	160	30	18
Hamilton Railway Light & Power	689	131	19
Ottawa Electric Company	267	40	15
Toronto Hydroelectric System...	575	150	26

"We decided that it would be unfair and improper to do anything for our men except contribute to the organized patriotic fund. All our contribution goes to the patriotic fund administered by the government or local commissions. We promised our men their positions back when they return from the war."

James L. Hutchings, of Rochester, said that his company had stopped employing men from the farms.

Samuel Scovill, of Cleveland, believed in giving the men that went to the front every encouragement.

On motion of Chairman Freeman of the Public Safety Committee, the following resolution was unanimously adopted:

"Resolved, That the sub-committee appointed by the Public Policy Committee, comprising Messrs. Lieb, Edgar, Insull, McCall, and Wagner, be continued as a committee of the Association with full authority to take such action in behalf of the Association, as they may deem advisable to establish full co-operation between the United States Government and the electric light and power industry of the country to the end that the best industrial results may be obtained in connection with the prosecution of the existing war. The committee is authorized to establish, or join in establishing and maintaining, an office in the city of Washington if deemed advisable, and to incur such expenses in the performance of their duties as they may find necessary."

W. W. Freeman added that "It would be unwise not to take advantage of the experience of the Allies, but there is danger that we may go a little to the other extreme. There are men in each one of our organizations who are essential to maintain the public service and we must make them feel that they are performing as much of a public duty in that work as they would be if they were in the trenches. We can in each case make it easy for men to go to the front, for the right man to go, the men who can be spared, and I feel so far as the organization for which I am responsible is concerned, that I would rather err on the side of the men who go as referred to by Mr. Alfred this morning than on the other side. We have the interests of the nation first at stake."

C. M. Cohn, of Baltimore, favored contributing to the patriotic funds the amount of difference between the government pay and their companies pay to the men that enlisted.

W. B. Tuttle, of San Antonio, Texas, said the selective draft would not send men with dependent families to the front at the present time.

H. H. Ganser said the war would be lost or won on the food production, and favored releasing his men with farm experience one day a week for farm work. This would be done in his state of Pennsylvania.

Officers Elected at Closing Session.

At the final session Thursday morning the following officers were elected for the ensuing year:

President, John W. Lieb; vice-presidents, W. F. Wells, R. H. Ballard, Samuel Scovill, R. H. McDougall, of Toronto; Treasurer, W. H. Atkins.

New members of the executive committee—Paul Spencer, Walter Neumuller and E. W. Lloyd.

The treasurer's report showed a cash balance of $87,000 in bank and accounts receivable of $57,000, additional accounts payable about $15,000. This is the best financial condition in the history of the Association. The officers of the national sections were continued in office.

The papers prepared for this convention and the various reports were approved as a whole as part of the proceedings. The secretary's report was adopted without reading. It showed that 40 leading members had died during the past year.

The amendments to the constitution as recommended were adopted without discussion. They comprised a reduction in dues of employees of foreign members, authorized a wider scope in geographic sections and expanded the definition of the objects of the Association along educational and scientific lines.

J. B. McCall, H. R. Harriman, W. F. Wells, H. L. Doherty, L. A. Ferguson, C. A. Edgar, J. W. Lieb and others discussed the hazard of lack of coal supply and its transportation and also the raising of capital for future needs of the lighting industry. On motion all these matters were referred to the Committee on National Affairs.

On motion of Mr. McCall a resolution of congratulations and commendation to President Wagner was unanimously adopted.

Abstracts of N. E. L. A. Papers and Reports

Annual Meeting at New York Considers by Title, Papers and Reports Prepared Originally for Atlantic City Convention

Report of Committee on Wiring.

R. S. HALE, Chairman.

S. E. DOANE, Vice-Chairman.

Standardization of Plugs and Receptacles.—Because of patent difficulties and trade disputes, the adoption of a single design of uniform arrangement, so that all plugs shall be interchangeable, has not been reached. The committee expects that standardization will be accomplished within several years.

Appliance Plugs.—The committee is conferring with manufacturers and discussing the problem of whether the appliance plug should have round, square or flat prongs, and if flat whether they should be placed parallel or tandem. Reports will be available next fall.

Polarity Plugs and Receptacles.—The committee recommends that all receptacles shold be designed for polarization.

Standardization of the Portable Cord.—Measures for standardization of the cord, as distinct from the plugs, considered undesirable.

Standardizing Range Connections.—Measures for standardization of the cord, as distinct from the plugs, considered undesirable.

Standardizing Range Connections.—The committee decided that standardization would discourage development, that manufacturers should supply demands for ranges fitted with or without built-in terminal boxes.

Pilot Lights.—The committee encourages the installation of a pilot light for one or more receptacles in rooms where portable devices are used, especially in commercial installations.

Concentric Wire.—The committee has asked that the use of concentric wire be sanctioned in the Code, and if not allowed generally that limits be made to permit manufacturers to put it on the market in quantities to make its cost reasonable. Reports from a number of central-station companies show that no trouble has resulted from various installations.

Other Methods of Wiring.—It is recommended that tests be made on use of lead-covered twin wire and other types.

Solid Neutral. — Recommendations continued for a solid neutral from the generator or transformer to the lamp in all grounded systems.

Color of Neutral Wire.—Unbleached cotton with paraffin filler, giving a whitish color, recommended. Weatherproof, instead of rubber insulation, is considered adequate for neutral.

Size of Wire.—The committee voted that the use of No. 16 or larger sizes should be encouraged for fixtures of portable or for any location where devices larger than the ordinary lamp would be used. No action was taken on the use of wire smaller than No. 14 in other locations.

Plugs for Fusing Solidly. — Sale should be restricted to central stations and reliable contractors.

Connection Between Inside and Outside Lines.—It was recommended that a standard set of rules, suitable to most of the companies, be prepared, and that each company publish same with addenda to provide for local conditions.

Report of Committee on Electrical Advertising.

C. S. BUTLER, Chairman.

This report presents the subject of electrical advertising from the point of view of the central station and the electric sign manufacturer. It emphasizes the fact that the lack of enthusiasm shown for this subject is not good business on the part of the central station. It shows in actual figures the kilowatt-hour sales that might be made by the central station in this branch of the business.

The report further embodies the suggestions of the committee as to the proper method of securing and maintaining this class of business. These suggestions include the striking from the vocabulary of the central station and electric sign manufacturer of the terms "electric sign" and "illuminated billboard," substituting therefor the term "electrical advertising."

The value to the central station of establishing sign maintenance by a patrol system is pointed out.

The committee not only recommends but makes a plea for the establishment of a flat rate for mediums of electrical advertising, and points out the need of the central station being the censor of all forms of electrical advertising mediums.

As sign ordinance agitation is often caused by lack of censorship on the part of the central station, the committee suggests means of anticipating such agitation and submits a model ordinance.

Co-operation between the electric sign manufacturer and the central station as one of the big factors in a successful electrical advertising campaign is shown to be an absolute necessity.

The essentials of what are good electrical advertising mediums from a commercial point of view, as they are brought out in the report, will be an aid to the manufacturers of electric signs and to the central station in its capacity of censor.

Report of Committee on Commercial Service and Relations With Customers.

R. F. BONSALL, Chairman.

This report deals with the practice of various companies in regard to applications, credits, meter reading, collections and complaints, including some recommendations by the committee.

A questionnaire was sent to 75 companies in various sections of the country, and replies were received from 38. The questions on applications were designed to show (1) the value of a customer's signature, (2) the advantage of leaving service available on vacant premises, (3) the use of telephone and mail requests for service, and the length of time required to connect service.

Credits also are considered, the method of obtaining credit data, when to require a deposit, when to return it, and exchange of credit information between companies.

Meter reading in its details is tabulated, methods of entering customer's premises, use of meter readers during spare time, connections found ahead of meters, etc.

Collections are considered, the handling of current and delinquent accounts and the practice of disconnecting for non-payment.

Complaints are discussed, the adjustment of bills, including grounded and unaccounted for use of service and investigation on customer's premises.

The answers show such a wide difference in methods among the members that the committee recommends the continuation of effort to bring about greater uniformity in the commercial relations with customers. The result of such effort may be at least the nucleus of a handbook on standard practice in this department.

Report of Committee on Electrical Salesman's Handbook.

R. H. TILLMAN, Chairman.

The committee reported that its work for the year has been confined to the making of additions to the various sections of the Handbook, without changing its form or shape.

The lighting section has new additions from manufacturers on reflectors, and on industrial lighting, outdoor lighting, and school and auditorium lighting.

The power section includes additions to data on power installations, useful isolated plant data, and short articles on air handling and refrigeration.

New data are furnished on electric heating and electric vehicles.

The committee also reports suggestions as to the circulation of handbooks, and the formation and work of the handbook committees in the future.

Report of Subcommitte on Commercial Aspects of Street and Highway Lighting.

ALVAH W. YOUNG, Chairman.

This report is a presentation by the committee of some of the evils which seem to exist in the methods of securing and following up street-lighting business, with recommendations as to how to correct these conditions.

It is pointed out that a standard schedule of cost items would, if adopted by the member companies, eliminate the wide difference in rates for street lighting which occur throughout the country.

The importance of this class of business is emphasized particularly because of its effect upon public opinion. The

importance of a concise and non-technical contract is also emphasized.

This report is a supplement to the report by the committee of 1916 and the recommendations contained in the previous report are heartily concurred in by this committee.

The committee recommends, finally, that all street-lighting contracts be handled by the new-business department and with the same methods and energetic following up that are successfully employed in all other classes of lighting business.

Report of Subcommittee on Commercial Aspects of Lamp Equipment.

O. R. HOGUE, Chairman.

The object of this report is to impress upon central stations the importance of making good installations, both as a means of educating the public in good illumination and as an important factor in increasing the lighting business of the company. It consists of five primary sections, most of which have one or more subdivisions. These subjects are as follows:

The *Introduction* is an explanation of the purpose of the report and a general outline of its scope.

The *General Discussion* covers in its several subdivisions the necessity for consideration of the subject, and the importance as well as the difficulty of choosing proper equipment. Some of the essential features to be considered are brought out by illustrations and curves.

Under *Selling Methods* are taken up the methods used in getting the equipment installed. Advertising, qualifications of salesmen, illuminating engineering service, and rental and deferred payments are all brought out.

Lamp Equipment includes illustrations of various types of equipment, all developed within the last few years, together with the applications and selling points of each.

In the *Closing Suggestions,* recommendations to central stations and manufacturers as to needed equipment are discussed, as well as suggestions for carrying on the future work of the committee.

Clocks in the Feld of Electric Light Appliances.

BY HENRY E. WARREN.

The conventional method of regulating frequency by depending upon the indications of ordinary frequency meters is not very accurate and entails an unnecessary amount of attention from switchboard operators. The frequency meters themselves are subject to noticeable temperature errors, and the instantaneous readings which they give are not a true measure of the average frequency. It is doubtful whether many power stations are operating at an average frequency within one per cent of its normal value.

By the method described the average value of the frequency is controlled by comparison between two revolving second hands on a clock dial. One hand is under the influence of an accurate pendulum and the other is driven by a synchronous motor. The operator is instructed to maintain the two hands together by adjusting the frequency. The attention required to hold the average frequency within one-thousandth of one per cent of its normal value is far less than is needed by the conventional method to secure decidedly inaccurate results. Thus with a considerable reduction in effort there is a great gain in precision.

Perfectly uniform frequency permits clocks and timing devices to be driven by self-starting synchronous motors of new design. The quality of the service exceeds any other commercially obtainable at present. The cost of the clocks is moderate and the monthly expense slight, thus making service available to all.

The benefit to electric lighting companies may be summed up as follows: Improvements in frequency, with corresponding gain for motor-driven machinery; moderate direct increase of income from clocks; gain in customers who are willing to pay for service in order to install clocks; gain in better and more reliable recording instruments and time switches.

Report of Committee on Compensation of Salesmen.

C. J. RUSSELL, Chairman.

The report analyzes the methods of compensation in use by many member companies of the association and the opinions expressed by them on the subject. Without presenting figures, which would be misleading for purposes of comparison, an attempt has been made to define the fundamentals of existing plans and also to give certain suggestions as to the working out of model plans of compensation.

The committee recommends that the collection of data should be continued during the coming year; that a comprehensive analytical study be made of the same and that the services of the committee should be offered through the Commercial Section to member companies along the lines of assistance and advice in matters relating to methods of compensation for sales forces.

Electric Range Committee—Report of Subcommittee on Standardization.

C. E. GREENWOOD, Chairman.

The central station is a clearing house for experience in range selling, and for the experience of range users. Based on this experience, and through observation, recommendations for standardizing the electric range along certain lines are believed to be expedient. These recommendations cover the following points:

Mechanical Construction.—Fewer models; standard over-all dimensions; fewer oven sizes; surface burners of standard sizes for the work to be done; in connection with the wattage of burners, at least one fast surface burner (approximately 2000 watts) is desirable; the easy replacement feature for all burners is urged.

Electric Construction.—Terminal boxes are not considered an essential for the range, and a simpler method of three wires leading out of the back of the range in a standardized location is preferable; separate fusing of range elements is urged and also the placing of fuse blocks for easy access; there would be an advantage in standardizing switch designs and switch operation; pilot lights on ranges are discouraged as not essential in the matter of safety, and not bringing about an economy that would justify installation cost; a receptacle on the range for plugging in practical accessories of the range is desirable.

Standardization.—Certain independent features are recommended among which are: ventilation of ovens and broilers; installation of drainage troughs and drip pans; non-rusting oven linings; the importance of selecting standard material for range frames and a durable finish for these frames is emphasized. These recommendations to the manufacturer, if followed out, would result in lower production costs; would simplify the repair and maintenance problem, which is the most serious the central station has to deal with; would be a benefit to architects and builders in planning model kitchens, and would greatly assist the more rapid development of the range market through better cooking service rendered to central station customers.

Electric Range Committee—Report of Subcommittee on Co-operation Between Manufacturers and Central Stations.

H. E. YOUNG, Chairman.

Advertising.—It is hoped that the coming year will see a larger measure of national advertising than has been undertaken heretofore. The committee feels that some co-operative advertising effort, along the line of electric cooking propaganda, would be of benefit, and that the originators of any national advertising effort might also develop copy for local advertising which could be distributed through the N. E. L. A.

There is room for improvement in publicity in the way of reading notices which can be printed in various newspapers as news items, as there is abundant opportunity to make such items interesting, and the household sections of most newspapers and magazines would be only too glad to get this copy, if it were presented in the right manner. If clippings of this character were sent to the N. E. L. A. they could probably be given a wide distribution.

The co-operation which has been given by manufacturers in the way of literature, such as booklets, circulars, window display material, etc., has been a benefit to the central station, and is being used constantly. The committee recommends that each manufacturer prepare a suitable booklet to be given with the range when it is sold and installed, this booklet to explain the general character of the range sold and how to operate it, and give some recipes for articles which can be cooked to advantage on that particular make of range.

Demonstrations.—It has been suggested that some sort of co-operative school for teaching electric range cooking would be advantageous, and this, in turn, might be made the basis of a school operated by central stations, so that the electric range may be advertised through the training of those having to do with the cooking in the home.

Lectures.—As central-station representatives often have opportunities to talk before women's clubs, domestic science classes, etc., it is felt that a well-prepared lecture and lantern slides for this purpose, prepared by the N. E. L. A., would be of advantage.

Suggested Association of Manufacturers.—Such an association has been suggested in the past, but the committee feels that it is not so essential at this time, inasmuch as the Range Committee of the National Association now offers a very good medium for co-operation.

Report of Committee on Underground Construction and Electrolysis.

E. B. MEYER, Chairman.

Current-Carrying Capacity of Cables.—The report this year deals with the heating of cables, and lays particular stress on the relation of load-factor to temperature. The results of recent tests by member companies are included, as well as curves showing the effects of load-factor on cable temperature.

Cable Specifications for Various Classes of Service.—Much has been done by the various technical societies toward the preparation of cable specifications, and in this report an attempt has been made to abstract these specifications, with references to the original authorities for further details. Attention has been called to the salient points to be considered in connection with the preparation of specifications for cables for various classes of service.

Use of Split-Conductor Cable.—The departure from the radial-feeder system in favor of the ring or network system, occasioned the development of the balanced method of relay protection. The disadvantages of the pilot-wire circuit originally used were serious enough to cause its abandonment, and the split-conductor method came into use. The report discusses the value and comparative costs of the split-conductor system and includes a splicing specification as used by a member company.

New Design of Three-Conductor Cable.—In the abstract of a paper by the inventor of a new type of three-conductor cable, the committee, without expressing any opinion as to the validity of claims, calls attention to what appear to be inherent defects in three-conductor cable as usually manufactured. The inventor's remedy is to eliminate the belt or girdle insulation, and to increase the thickness of insulation on the individual conductors, surrounding the insulation with a wrapping of metallic ribbon to equalize tangential stresses.

Special Devices and Methods.—Under this heading the report describes special devices and methods as adopted by member companies in the solution of operating problems, as follows:

(1) Service bus in manholes in cases where original service-box installations are not sufficient to take care of the ultimate number of customers.

(2) Sealing of cable ends to prevent absorption of moisture.

(3) The use of a welding outfit to effect a saving in repairing heads and frames of manholes.

(4) The use of a portable blower for clearing manholes of gases when emergency repairs are necessary.

(5) The draining of manholes by the use of a dry well.

(6) The use of a furnace wind-shield to accomplish a saving in fuel and a reduction in accident risk.

(7) A specially designed container with all joints welded to prevent deterioration by heat and possessing features which reduce the chances of accident.

(8) The advantages of employing a power trenching machine in digging trenches for conduits, where few subsurface structures will be encountered.

(9) The use of a spacing block at the point where ducts enter a manhole, to secure perfect alinement of the conduits.

(10) A discussion of the possibilities of using direct-current equipment for cable testing to overcome difficulties now encountered in the use of alternating-current equipment.

(11) The measurement of dielectric losses of cables under normal conditions of operation, for the purpose of obtaining information as to the condition of the insulating medium.

Report of Committee on Meters.

C. H. INGALLS, Chairman.

The efforts of the committee during the past year have been directed mainly to the completion of Section X of the Code for Electricity Meters, to a continuation of the investigation of instrument transformers and, through the co-operation of meter committees to be organized in each geographic section, to getting into closer touch with the meter situation throughout the country. Considerable time has been devoted to the consideration of such specific metering problems as house loads, shunted-type meters and meter standardization. The Addendum to the "Electrical Meterman's Handbook," together with a new edition of the handbook itself, has been published.

Unforeseen difficulties were encountered in condensing and editing the mass of manuscript collected for the meter lecture, but it is expected to have this lecture completed during the year.

The report describes and illustrates the new development in electric meters for the year, and contains the parts of Section X of the Code already completed and a compilation of data on watt-hour meter jewels.

Report of Committee on Electrical Apparatus.

G. L. KNIGHT, Chairman.

The committee has brought about a few important changes in transformer standards, which now represent the opinions of central-station engineers in all parts of the country, due to arrangement for more active participation in committee work on the part of Pacific Coast engineers. The need for proper care in the handling and treatment of transformer and switch oil led the committee to prepare a treatise on this subject which was included in its report. The recommendations made should permit keeping such oil in perfect condition.

The campaign for general adoption of the Uniform Rules to Govern the Installation and Use of Motors on Central-Station Distribution Systems has been continued with good results. The committee is co-operating with the Standards Committee of the American Institute of Electrical Engineers in drafting standardization rules.

Progress in the development and application of electrical apparatus is reported as usual. There is now an unusually large production of large turbogenerator units of 20,000 kilowatts and over. Frequency changers and synchronous converters are also being produced in larger sizes. A new, simple and self-contained lubricating-oil system for bearings of hydroelectric generators is described. An important article on the design of full structures for direct-current machinery is included in the report. Developments in the induction type of regulator and in a motor drive for high-lift hoists are reported. Outdoor-substation developments are in a tendency to standardization to promote lower cost and greater speed in installation. The use of static condensers has been proposed as a means of correcting for power-factor in small installations. The committee recommends the specifying of larger current capacity than are actually needed in switches and circuit-breakers, because of the difficulty of maintaining their rating without very careful attention. An interesting device is reported for preventing several electric welding machines from taking current at the same time.

Report of Committee on Overhead Lines and Inductive Interference.

H. B. GEAR, Chairman.

This report outlines the status of inductive interference as regards ground return rural telephone lines, metallic circuits, and interference from series lighting circuits. It emphasizes the importance of power company engineers co-operating with telephone engineers in the solution of these problems and informing themselves as to the principles on which means for mitigation of induction are based, so that they may be thoroughly familiar with the conditions in power systems which are likely to lead to inductive troubles.

The report outlines the progress made in various states during the year in the matter of codes of rules affecting overhead line construction and indicate their relation to the National Safety Code. The committee urges that all companies co-operate in a trial of the lines section of the National Safety Code in order that an accumulation of reliable data may be facilitated.

Attention is called to the importance of member companies reporting to headquarters in proceedings arising in connection with state commissions, looking toward the establishment of codes of rules for overhead lines. It is very important that the industry as a whole be kept informed of all cases of such proposed action.

The report embodies a valuable appendix, written by J. B. Taylor, outlining some of the fundamental principles of inductive interference.

Methods for Working on Live High-Voltage Lines.

By J. O. HARDIN.

Mr. Hardin's paper shows the need of working on high-voltage lines while live in order to maintain continuity of service, one of the strongest arguments for central-station service. He described in some detail the very successful methods employed by the Georgia Railway & Power Company for repairing, maintaining and remodeling overhead high-tension lines. He takes up in particular the changing of pin-type, suspension and strain insulators, replacing of the poles and crossarms, etc., describing the practice on live lines up to 110,000 volts. By the use of special tools mounted on insulating switch sticks, by insulated ropes and special live lifters this work can be done without serious life hazard. It is necessary to employ cool and intelligent linemen for such work, however, and not hurry them at their tasks. Illustrations are shown of the methods and equipment used.

Electricity in Ice-Skating Rinks

Details of Electrical Equipment in Two Large Chicago Rinks Using Central-Station Service—Advantages of Operating as an Ice Plant During the Summer Shown

By C. J. CARLSEN.

Refrigeration Engineer, Commonwealth Edison Company, Chicago.

ICE skating has ever been a popular sport in Chicago as evidenced by the tremendous crowds present at the numerous parks, but weather conditions have been such, at least in the past few years, as to be most disheartening to lovers of the sport, for with outdoor skating one can never tell when to expect a snow or rainstorm, a sudden rise in temperature or a sudden drop to bitter cold.

Ice rinks have flourished in many parts of Europe for years, as also in New York, Pittsburgh, Boston, Detroit, Cleveland, St. Paul and other large cities of our own country, giving pleasure and enjoyment to its many thousands of people, and yet Chicago waited.

In common with other cities, Chicago has enjoyed the small rinks in cafes and restaurants, but these have been for exhibition purposes and not for use by the general public. Undoubtedly, however, they have had their effect in educating the people to the excellent advantages of indoor skating and during the year two mammoth ice rinks have been installed, one on the South Side and one on the North.

Equipment at White City Rink.

The South Side rink was the first to get under way. This was constructed by the White City Amusement Company on its premises at Sixty-third Street and South Park Avenue, and intended as a winter attraction for this famous and popular amusement park.

The accompanying illustrations show the general characteristics of the rink. The entrance on Sixty-third Street is both attractive and artistic and the rest and recreation rooms are very complete in all their appointments. This part of the rink is heated and ventilated.

The power plant adjoins the recreation room to the east. Here are located the various machines used in the operation of the rink.

To furnish the necessary refrigeration effect two compressors are required, both York vertical duplex, single-acting, one being 14 by 21 inches belted to a 125-horsepower motor and the other 12.5 by 18 inches belted to a 75-horsepower motor, or a total refrigeration capacity of 105 tons. The condensers are double pipe and are located in the southwest end of compressor room.

Two 25-horsepower brine pumps, located in the compressor room, are used for circulating brine through the coils of the rink floor and a 10-horsepower motor tractor is used for surfacing the ice after being frozen.

In addition there is a five-horsepower skate-grinding motor, one two-horsepower motor on the condensation returns of the heating system and a one-horsepower motor on sump pump for ejecting sewage and seepage water from engine room, there being a total connected load of 268 horsepower. The heating system is of the semi-vacuum, low-pressure type.

The transformer vault is located on the west side of compressor room, the service being brought in underground at 12,000 volts, 60 cycles, three-phase and transformed to 230 volts. Here are located three 100-kilowatt transformers for power and one 30-kilowatt transformer for lighting service.

The skating pavilion is located immediately south of the rest room and adjoining it. It is of mill or wooden construction and for that reason could not be inclosed on account of building ordinances. It is protected on the sides, however, by heavy canvas curtains as part protection against the wind

Exterior View of Chicago's New Ice-Skating Rink on the North Side.

and elements. From the roof in the center of the pavilion is suspended a stand for the use of the band.

The ice surface of the rink floor is 91 by 240 feet in which is embedded 54,800 feet or over 10 miles of 1.25-inch pipe. These pipes are placed 4.5 inches from center to center. The six-inch headers for feed and return are both on the east side of the rink floor extending its entire length and

Skating Surface at White City Ice Palace.

the 1.25-inch laterals, starting from the feeder main, extend the width of the rink floor and with a return bend extended back across the floor to the return main. By this arrangement there is flow and counter flow in each alternate pipe tending to equalize temperature losses.

These pipes are leveled upon wood stringers set on cement bases and the pipe laterals are embedded in sand so that only about one-half of the pipe is exposed to the ice surface.

In operation the cooling effect from the ammonia compressor is delivered to the large brine tank in the compressor room where the brine is cooled to about zero degrees. This brine is then circulated through the grill work of pipes in the rink floor by means of the brine circulating pumps before mentioned.

In freezing, water is sprayed over the floor until ice of the proper thickness has been formed which is usually from two to three inches and this surface is then planed or scraped to a uniform surface by a tractor scraper mentioned earlier in this article, the motor being operated from a flexible cord, the tractor being guided very much as an automobile. After the first surface has been formed subsequent spraying and surfacing is not a very difficult matter.

The lighting of this rink is accomplished by means of 26 1000-watt nitrogen and two 300-watt, 21 150-watt, two 100-watt, seven 60-watt, one 40-watt and 19 25-watt tungsten lamps, or a total of about 31 kilowatts connected lighting load.

For this season's operation very little data are available. It was started on December 23 and shut down April 1. During that period there was an almost continuous stretch of cold weather and as the skating pavilion was an open one protected by canvas curtains only the kilowatt-hour consumption for the period of run was very low. Next year it is the intention to make this an inclosed rink with a tempered heating system and naturally its operation for holding ice temperature will be much higher than when aided by natural weather condition.

It was also the intention to make this plant a combination one, ice manufacturing in summer and rink in winter, but the season was so far advanced before work was actually started that it was impossible to procure the necessary materials for the ice plant.

Equipment of North Side Plant.

In planning for the North Side rink many locations were considered but all fell short of the qualifications of the one finally selected, that of Broadway near Thorndale Avenue.

Here was a large tract of vacant land owned by the Boyle Ice Company and adjoining its artificial-ice factory to the south.

The Chicago Arena is undoubtedly the largest and most magnificent ice rink under cover in the world and reflects great credit upon the architects and engineers who designed and constructed it.

The rink has an ice floor of 115 feet by 295 feet. The main building is 166 feet by 360 feet with a wing 80 by 95 feet for skates, lockers, etc., and a power plant building 53 by 100 feet adjacent to but separated from the main building.

The buildings are of brick, the main building front having a very pleasing design in brown with massive Bedford stone entrance. The roof trusses are supported on iron columns, the roof being of concrete supported from trusses and the trusses themselves being encased in tile.

The control room is located in the southeast corner of the arena and here is located the switchboard for controling heat, ventilation and lighting systems, the room itself being separated from the arena by heavy plate-glass windows.

The ice floor, as indicated in one of the illustrations, has large, sweeping curves at the corners, so that skaters utilize all of the ice and on each side of the rink is a double continuous cushioned seat for the skaters.

The freezing medium of the rink floor consists of 106,200 lineal feet or about 20 miles of one-inch pipe laid four inches apart, across the rink. The only preparation for this pipe work was 4 by 4-inch timbers every seven feet and in turn resting on short lengths of 2 by 6-inch creosoted sleepers. After piping has been installed a sand bed is built up so as to cover about one-half of the one-inch pipe, leaving the

Skating Surface at Chicago Arena.

other half of the one-inch grill work exposed and upon which to build the ice floor.

These one-inch laterals are fed from eight-inch brine mains, the brine main feeding a sub-main which in turn feeds 18 of the one-inch laterals in parallel. Similar headers on the opposite side receive this brine and in return deliver it to an adjacent battery of 18 one-inch pipes. To prevent short-circuiting of the brine one of the eight-inch mains run the full length of the rink floor and doubles upon itself.

The successful operation of a rink depends upon many

factors but one of the most important is the proper control of the condition of the ice surface at all times, for ice too hard is just as objectionable as when too soft when used for skating purposes.

Here the control system designed and patented by D. H. Scott, of Cleveland, is used. In effect its purpose is to maintain under all conditions the temperature of the ice body at about 24 degrees Faherenheit or below 27 degrees, while the surface is close to the melting point, or approximately 32 degrees.

This will maintain the ice so hard that a skater will not cut deeply into it and at the same time the pressure of the skate on the ice surface will be sufficient to slightly melt the ice beneath the runner, supplying the needed lubrication for easy motion of the skate.

Under such a system the snow or scrapings caused by skating will continually melt, fill the grooves made by skating and re-freeze, maintaining a practically smooth surface. To some this may sound like theory but a continuous practical demonstration can be observed by anyone at any time when the rink is in operation.

There are, of course, many conditions that affect the ice surface, such as outside temperature, humidity and thickness of the ice, and all must be carefully watched in order to obtain proper results. At four different points in the rink floor are imbedded in the ice electrical resistance thermometers and electrical thermometers are suspended from the roof as well as being located in the brine-circulating pipes and these, as well as other thermometers, hygrometer, barometer and wind compass can be read at the switchboard of the control room.

The heating coils for air tempering of the arena are located in upper diagonal corners, and supplied with either exhaust or live steam. No. 6 Sirocco fans, each operated by a five-horsepower motor are used for ventilating. On the second floor, directly over the control room in the southeast corner, is located the air-cooling room and contains 14 stacks of one-inch pipe 27 pipes high and 40 feet long.

Brine is circulated through these coils from a four-inch

Switchboard for Temperature Control at Chicago Arena.

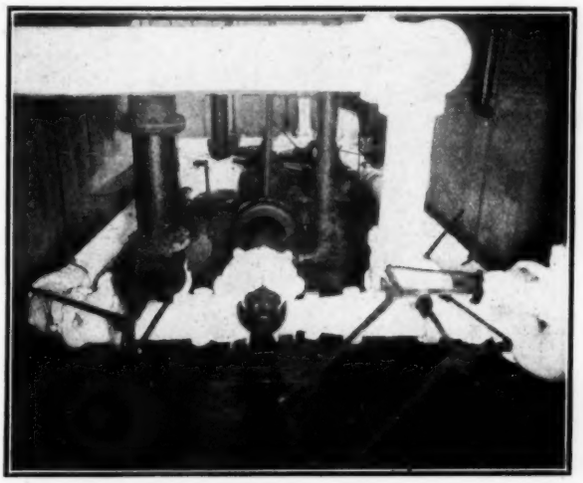
centrifugal pump driven by a 10-horsepower motor. The air is drawn in from the arena, through these cooling coils in the cooling room, and discharged again into the arena by a 144-inch blade fan driven by a 25-horsepower motor.

At different locations about the rink are six agitating fans 48 inches in diameter and each driven by a two-horsepower motor. The function of these fans is to mix the hot and cold air as it is forced into the arena. These fans are provided with gates or vanes which permit them to take air from the outside or from the rink.

The preceding equipment is a part of the temperature-control system and is operated from the control room previously described.

Auxiliary Electrical Equipment.

In addition there are in this building a five-horsepower motor used for grinding skates, a five-horsepower air com-



Motor-Driven Brine-Circulating Pumps at Chicago Arena.

pressor motor, a 10-horsepower water pump motor and a 10-horsepower motor used on tractor for surfacing the ice.

Initially the refrigeration required for plant operation is obtained from the Boyle Ice Company adjacent. Here is a total installation of 293 horsepower connected load, although the only portion of the plant required for rink purposes is a 50-ton compressor driven by a 125-horsepower motor, a 20-ton compressor driven by a 50-horsepower motor, both Larsen vertical double-acting machines.

A 570-pound can tank is used for cooling the brine before delivery to the rink coils, and a 10-inch brine line connects this tank with an eight-inch centrifugal pump driven by a 40-horsepower motor located in the power house of the arena.

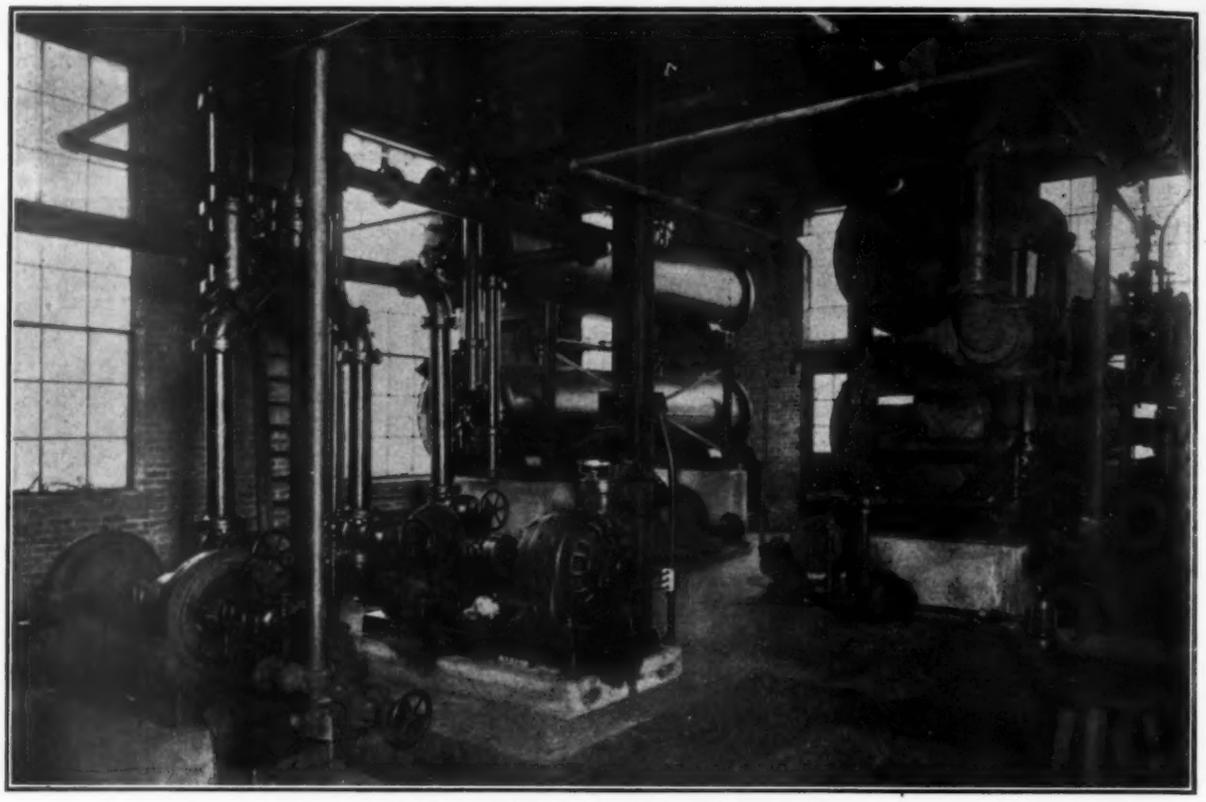
Power Plant Equipment.

In the power plant of the arena are two 250-horsepower horizontal return tubular boilers equipped with Detroit mechanical stokers, operating at a pressure of 125 pounds when needed but intended ordinarily for heating system.

A 125-ton exhaust-steam Vogt absorption refrigerating machine is installed as an emergency unit as well as to use during the peak period of operation. The generator consists of two cyclinders, each 44 inches in diameter and 17 feet long. The absorber is of the horizontal tubular type 60 inches in diameter and 20 feet long. The flow of weak liquor from the generators is controlled by an automatic regulator and the ammonia pump is steam, simplex, direct acting 16 by 7.5 by 16 inches, controlled by a Mason governor. There are two 42-inch by 16-foot shell-and-tube type condensers, and the exchanger is of the multiple type, two stands five pipes high and each pipe eight inches in diameter.

The rectifier is of the multiple type, six pipes high, located on the roof, while the weak-liquor cooler is of the same construction as the exchanger and rectifier. An additional brine-storage tank 12 by 10 by 12 feet is located in the power plant. Practically all of the equipment is installed in duplicate in order to care for any temporary shut-down of power, although the plant is not in itself near large enough for continuous operation of the arena floor.

The tower water-circulating pumps are in duplicate, being 30-horsepower steam-driven and 30-horsepower motor-driven as likewise the 40-horsepower steam-turbine-driven



Equipment in Refrigerating Plant at Chicago Arena.

Motor-Driven Refrigerating Machines at White City Ice Palace.

brine pump and the 40-horsepower motor-driven pump. The brine pumps are centrifugal pumps of 1500-gallons-per-minute capacity against a 60-foot head.

The pipe lines are so connected that any method of circulation of brine can be accomplished either from one plant or the other or both.

The connected load, including the compressor load at the ice plant, is 377 horsepower in motors and a connected lighting load of about 75 kilowatts.

In operation the combination of an ice plant and skating rink should be an ideal one with their loads conforming one to the other's needs. The ice rink business begins in November, at the time when the ice load has dropped off, and ceases in May, at a time when the ice load is coming on again, making practically an all-year load with a correspondingly high load-factor both for investment as well as operation.

The operation has been for too short a time for operating figures to be of any value, and for that reason none will be given at this time.

Both of these rinks operate from central-station service, energy being supplied by the Commonwealth Edison Company. H. C. Wood is vice-president and general manager of the Chicago Arena and it was due to his untiring efforts that Chicago has been provided with such a comprehensive amusement palace.

Two Irons Not Necessary for Continuous Service.

In our issue of April 14 there appeared an article in which it was recommended that two irons be installed in laundries for each laundress, so that the laundress would not have to occasionally wait for the iron to get back to working temperature.

Exception to this suggestion has been taken by the iron manufacturers and the following statement from the Hotpoint Electric Heating Company is typical of their attitude.

"If this condition had been put up to us as manufacturers, we would have recommended that the laundry install an iron of the proper size for the handling of this kind of work.

"There are many laundries in the United States equipped with Hotpoint irons, where the irons are operated continuously. There is no need for each laundress having two irons.

"For your information, our laundry irons runs from 7.5 to 15 pounds in weight, wattages from 700 to 900. We would recommend any one of these irons to be operated nine hours continuously and give satisfaction. We are sure the same applies to irons of the same sizes made by other manufacturers of heating appliances."

Lighting-Fixture Dealers Organize Southwestern Illuminating Society.

Kansas City lighting-fixture dealers have organized the Southwestern Illuminating Society, with the threefold purpose of improving the methods and practice in making and installing fixtures, of assisting members to better business methods in their establishment and educating the public to higher appreciation of what modern illumination means.

The society is starting at the foundation—figuring costs. Already some of the firms have discovered that they have been losing money on certain classes of work—and they are looking more closely to their charges and their costs. There is free exchange of information on the costs of supplies and labor; the firms which now have extensive accounting systems are giving others the benefit thereof. The society is getting inspiration from talks by members of other industries that had already tackled and solved this question of costs, and all the members are joining the organization work with enthusiasm.

There are no restrictions on membership, anybody being admitted who is actually in the business of illuminating, whether the extent of his business is large or small. Indeed, special efforts are made to get the smaller firms in, the larger ones in most cases seeing clearing the advantage of the purposes of the society to the industry, and not needing much persausion. The society has almost a 100 per cent organization now in Kansas City. It will eventually extend its scope to the Kansas City territory, which probably will come after definite plans for educational work have been formulated and the credit interchange department is started.

The following officers took charge of the society March 15, after two weeks' preliminary work: John J. McGee, president; W. T. Flippen, vice-president; A. S. Viner, secretary, and S. P. Russick, treasurer. Meetings are held twice a month. With 18 firms as members, the attendance at the meetings runs from 25 to 30, the cost accounting discussions making the meetings particularly valuable to inside as well as outside men and to the managers.

Utilizing Power Developed in Testing Automobile Engines.

The accompanying illustration is from a photograph made in the plant of the Reo Motor Car Company, Lansing, Mich. Every engine that goes into a motor car is given a severe power test of several hours' duration, during which it operates under full load. The engines are mounted on platforms so that they can be direct-connected to the Allis-Chalmers direct-current generators shown in the foreground.

Formerly the power developed by the generators was absorbed in water rheostats—a complete loss. Now, however, the current is collected from the individual switchboards and passed through a 2,300-horsepower rotary-converter unit and used for general light and power purposes.

Automobile Engines Under Test Furnish Electric Power.

There are facilities here for testing 100 engines at once. The power so developed and saved averages 300 kilowatts throughout the day. When the photograph was taken, 82 engines were under test and the din was something greater than Niagara.

Legislature for One Public Service Commission in New York.—The New York Senate has passed by a vote of 30 to 14 the bill introduced by Senator G. F. Thompson, providing for a State Public Service Commission of nine members, in place of the two present commissions of the First and Second Districts, each composed of five members, with salary of $15,000 a year each. The new bill also includes a rapid transit commissioner to have jurisdiction over subway construction, operation and maintenance in New York.

New Turbine Installed in St. Louis Power Station

A 25,000-Kilovolt-Ampere Unit First Step in Replacement of Old Generating Equipment at Ashley Street with Turbine Equipment

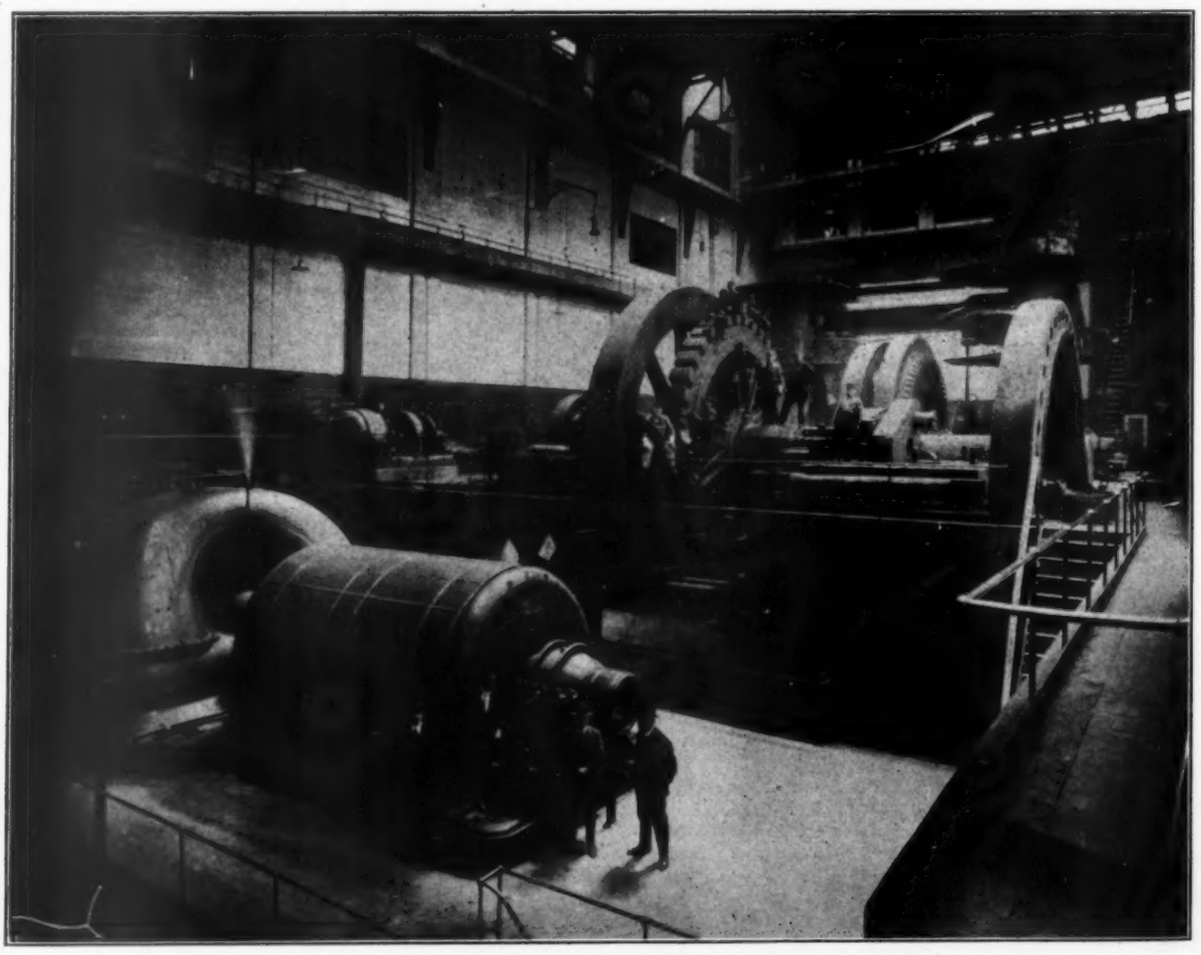
THE new 25,000-kilovolt-ampere turbine, which has recently been placed in service by the Union Electric Light & Power Company of St. Louis, Mo., marks the completion of the first stage in the new development of Ashley Street station.

During the past 15 years this station has grown from a plant of 12,000 kilowatts capacity to one of 120,000. In passing through these various stages of development, the company has been keeping pace with the rapid growth of the electrical industry in St. Louis as well as the rapid growth in the art of steam-generator design. Great strides have been made in the field of steam-turbine generators since Ashley Street station was built. The first turbine units installed in this station were 2000-kilowatt vertical Curtis units and there were installed between 1906 and 1912 other vertical turbines of 5000 kilowatts capacity, these being later replaced by similar units of 12,000 kilowatts capacity. The original 2000-kilowatt turbines were very soon replaced by horizontal 4000-kilowatt turbines. The reciprocating engine units aggregating in all 12,000 kilowatts capacity have remained in their place and have been operating up to within three years in connection with the turbine generators. However, as the turbine capacity became greater, it has been found feasible at this time to replace all of these engine units by horizontal turbine units which will aggregate 75,000 kilowatts. These units will occupy the same space as was formerly occupied by the reciprocating engine units.

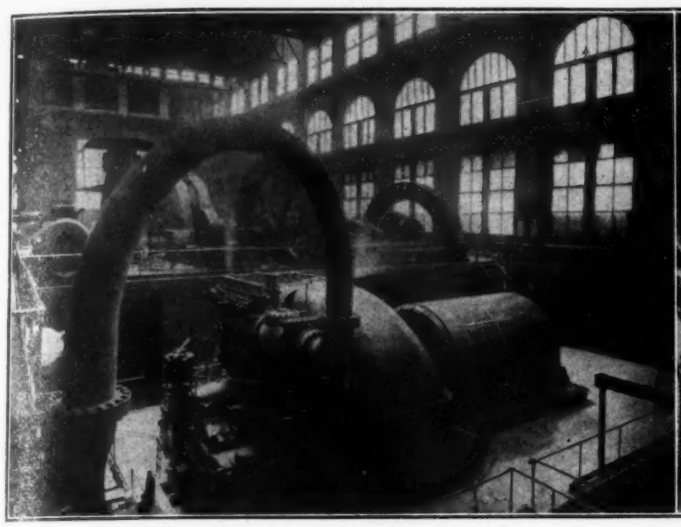
By increasing the station capacity to such a large extent, it has also been found necessary to increase the switchboard accommodations for handling the current generated by these turbines. A very large addition has therefore been built during the past year to the switchboard structure and without doubt the new switchboard at Ashley Street plant is one of the most up-to-date and modern of any switchboard equipment in the United States.

With removal of all of the old reciprocating engines at Ashley Street the station is now about to be converted into an all-turbine generating station. The equipment is the most perfect that money can buy, representing the latest development in all phases of steam and electrical equipment.

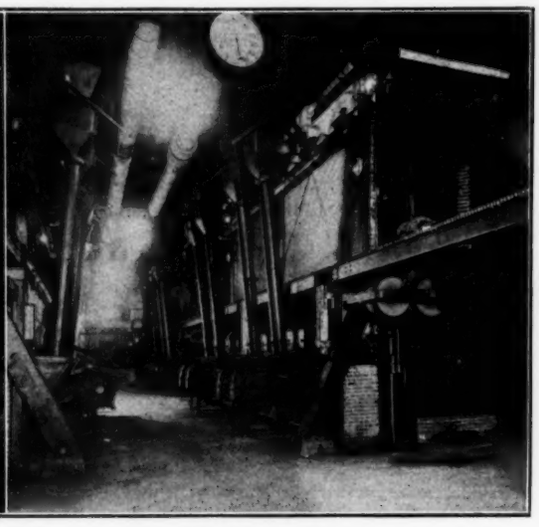
One of the accompanying illustrations shows the new unit in its position in the plant on the site of the old 3000-



New 25,000--Kilovolt-Ampere Turbogenerator Installed by Union Electric Light & Power Company.



Another View of Turbogenerator.



New Boiler-Room Equipment.

kilowatt engine. The cylindrical portion of the machine in the foreground is the electrical generator end which is driven by the steam end of the machine seen in the background. Steam is supplied to the unit through the bent pipe seen at the left in this picture. This steam is admitted through a series of valves, the tops of which are to be seen immediately above the steam end.

In making room for this new turbine-generator, it was necessary to remove, aside from the foundation of the old engine which stood on the site, about 2500 cubic yards of solid rock. This material, consisting of more than 150 car loads of rock, was removed by the use of dynamite. The foundation for the unit is built up of concrete heavily reinforced with steel firmly imbedded in the solid rock beneath. There was placed in this foundation something over 14 carloads of concrete in addition to 20 tons of reinforcing steel. The structure, which is entirely independent of other machinery and of the building proper, is not affected in any way by the strains or vibration from adjacent equipment. Below the base of the turbine and suspended within the walls of the foundation is the surface condenser into which all of the steam is expelled as it leaves the turbine. In order to condense all the steam required to drive this unit at full capacity, it is necessary that approximately 50,000,000 gallons of cold water be circulated through the condenser tubes each day. The condenser itself contains something over 8,000 brass tubes one inch in diameter and 18 feet long and has 40,000 square feet of cooling surface.

Approximately 240,000 pounds of steam per hour are required to drive the generator. This steam is evaporated in the boiler plant where new boilers have been installed for supplying the additional steam required for the increased station capacity. One of the views herewith shows some of the new boiler units which have been installed during the past year. These boilers, of which there are 10, are capable of delivering 1500 boiler horsepower per hour operating at a steam pressure of 225 pounds per square inch with steam superheated to 150 degrees Fahrenheit.

The furnaces and stoking equipment in connection with these boilers are an interesting feature. The stokers are known as the underfeed type in which the coal is delivered beneath the surface of the fire and is driven forward by means of constantly moving rams which are operated by a driving mechanism in the front of the boiler. An air blast is applied beneath the furnaces by means of blowers which are located in the boiler-room basement.

For the purpose of reclaiming heat which has passed through the boiler and has failed to be absorbed by it, all of the gases from the combustion of the fuel are drawn through so-called economizers before they are expelled through the stack. These economizers are made of a great number of steel tubes through which the boiler-feed water is forced before it is admitted to the boiler proper. This water, in passing through these tubes which are exposed to the heat of the escaping gas, is raised in temperature about 100 degrees, thereby decreasing by approximately nine per cent the amount of fuel which would otherwise be required to evaporate the water.

The circulating water which is used for cooling and condensing the steam which is exhausted from the turbine unit, is supplied through an intake tunnel which has been driven through solid rock out into the river. At the river end of this tunnel a series of grating, gates and revolving screens make it impossible for any foreign objects, of size sufficient to be objectionable in the condenser, to enter the tunnel. This tunnel is six feet by seven feet six inches in section and is at an elevation which makes it possible at all times during the year for water to flow by gravity into the pumps. A discharge tunnel has also been driven which removes all of the water from the 12,000-kilowatt turbines as well as the new turbine units, and returns this water to the river at the down stream end of the plant. The driving of the circulating water tunnels was one of the most important and interesting engineering features in connection with the new development at this station.

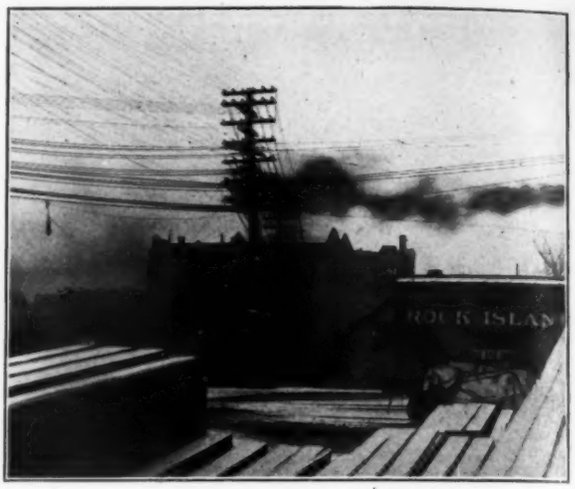
New Telephone Building in Chicago.

Evidence of the rapid development of the telephone business in Chicago is seen in the construction, by the Chicago Telephone Company, of another large office building in the loop district. The Company now occupies a 20-story building at 212 West Washington Street, which is one of the largest structures in the world devoted to telephone purposes. In addition, it has 39 other office buildings scattered throughout the city.

The new addition to the telephone group is located at 311-15 West Washington Street, diagonally across the street from the present general office building. It is to be 11 stories in height and the front elevation will be the Venetian Gothic style of architecture.

Work on the new building was commenced October 21, 1916, and the steel structure is now well under way. The building is of the court type, with a frontage of 135 feet on Washington Street and a maximum depth of 180 feet. Each wing will be 43 feet wide. While the original plans provide for the construction of eleven stories, the foundation is such as to permit of the addition of more floors as they may be needed in the future.

West Side Terminus of River Line.



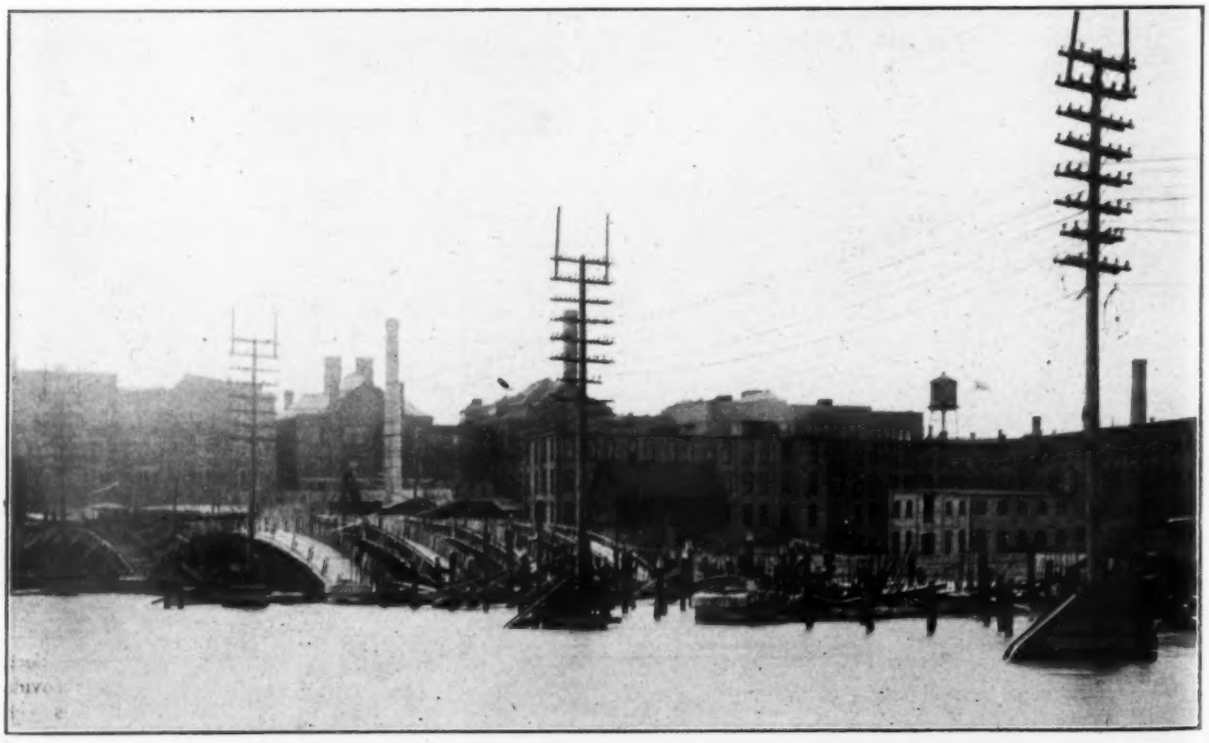
View of Pole Line from Plant.

A Difficult Pole-Line River Crossing

Rockford Electric Company Constructs Temporary Line to Guard Against Interruption to Service—Unique Construction Features Necessary Because of Ice Gorges In River

AN EXAMPLE of the extreme precautions which a central-station company will take to insure continuity of service is well exemplified by the special pole line which was constructed by the Rockford Electric Company, Rockford, Ill., across the Rock River. The generating station of the company is on the east side of the river, while the main business section and a considerable portion of the power business is located on the west side. The main feeders to the west side were formerly carried on a truss bridge, but this structure was recently removed to be replaced by a modern concrete arch bridge. It, therefore, became necessary for the company to provide some means for running lines to the west side, pending completion of the new bridge, and the expedient of a temporary pole line, set in the river bed, was decided upon.

It should be stated that the company already had three submarine cables between the power station and the west side which would probably have been of sufficient capacity



Pole Line Built Across Rock River for Service During Construction of New Bridge.

to handle the load, but to guard against any overloading of these feeders in case of new business that might be secured, and, primarily in the interest of good service to its present customers, the company decided to supplement the submarine cables with this temporary overhead line.

The Rock River at the point of the pole-line crossing is about 750 feet wide and has an average depth of from 12 to 15 feet. Also, the point of crossing is just above a dam and the current in the river is very swift. In addition to these conditions which had to be overcome, extraordinary precautions had to be taken against breakage or total destruction of the line by reason of ice floes which form in the winter and which pass the point at which the line is constructed with considerable velocity at the time of the spring thaw.

With a full realization of these difficulties, the first step in the construction of the line was to drive a number of piles at the proposed location of each pole. The poles were then set so as to be entirely surrounded by these protecting piles and all were bolted together. To further guard against ice floes, a V-shaped wedge of approximately 15 piles was placed on the up-stream side of each pole. An I-beam was placed over the piling with one end slightly submerged in the river. An idea of the construction which was necessary can be gained from one of the accompanying illustrations. It will be seen that the piers for the new bridge are already in place and advantage of this was taken by further bracing the poles.

This temporary line was built last fall and successfully withstood the ice floes during the past three months. However, had trouble been encountered, the company was prepared to remove short-circuit conditions with little or no delay and supply all service to the west side by means of the submarine cables already referred to. The company installed oil switches on all alternating-current circuits on this line, so that in order to re-establish service in case of failure, it would have only been necessary to clear the short-circuits and close the oil switches, thus establishing service through the submarine feeders.

The poles used in this line are Western red cedar, 55 feet high with eight-inch tops. The line comprises alternating and direct-current cables, there being an aggregate of three 4,000-volt circuits, six arc circuits and 15 cables of 500,000 circular mils for direct-current service.

This pole line was constructed under the supervision of R. M. Bert, electrical superintendent, of the Rockford Electric Company.

Youngstown Company Adds 2,400-Horsepower Load.

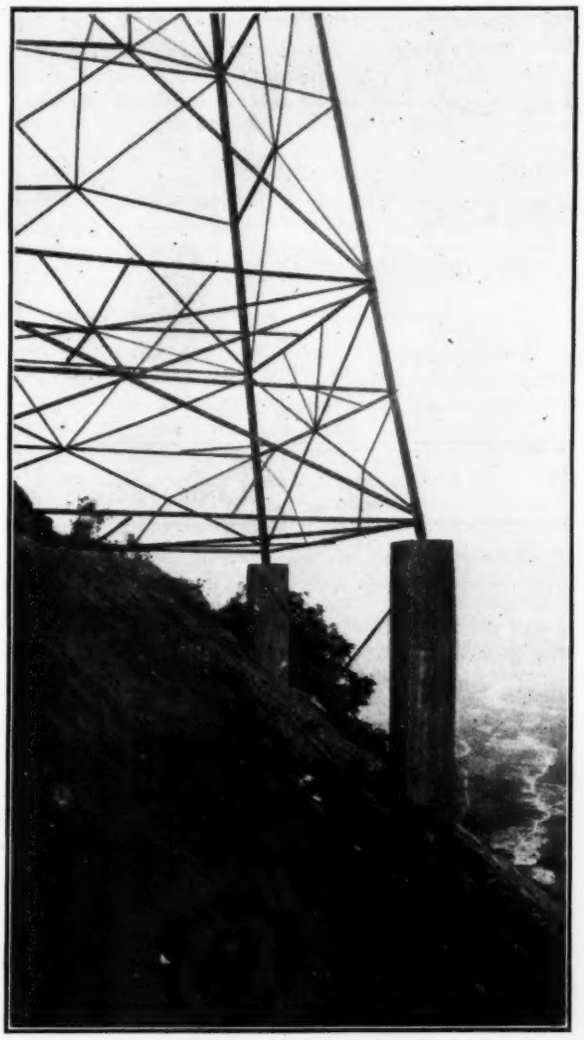
Three large power contracts, totaling 2,400 horsepower, have just been closed by the Mahoning & Shenango Railway & Light Company, with main offices in Youngstown, O. One contract for approximately 1,500 horsepower will electrify a large section of the plant of the Crescent Portland Cement Company at Crescentdale, Pa. Another, for 600 horsepower, will be for the entire power requirements of the Ohio Steel Products Company, manufacturers of automobile tubing, at Mineral Ridge, O. The third will cover the power requirements of a new plant of the Valley Mould & Iron Company, of Sharon, Pa., which is being rushed to completion at West Middlesex, Pa. The load there will be 300 horsepower.

New Type of Foundation for High-Voltage Towers.

By Albert Marple.

A novel method of placing high-tension steel towers "on stilts" has just been devised by electrical engineers in Los Angeles, Cal. These lofty towers, which average about 75 feet in height, are used to support the high-voltage wires of the Los Angeles aqueduct electric power system from Owens River, in Inyo County, to Los Angeles, a distance of more than 200 miles. Wherever the bases or foundations of these piers are at all threatened by washouts as a result of storms, floods, etc., the line has been taken from the lower levels and run along the tops and sides of the hills and mountains along the route. So steep are some of the mountainsides, to which some of these towers are now clinging, that to place all four corners of the bases of these towers upon the earth would call for an enormous amount of excavation work which, on account of the peculiar locations of these bases, would prove extremely costly.

In order that a great deal of the expense of "planting" these towers might be eliminated, the engineers have devised the novel stilt method of providing elevated foundations for



Concrete Foundation for Tower in Mountainous District.

the "outer" corners of the towers shown herewith. These foundation piers are made entirely of concrete and are solid. It would be practically impossible to create a more rigid and firm foundation. They are about 2.5 feet in thickness and range, above the ground, from 4 to 15 feet in height. They extend quite a distance into the earth and rest upon slabs of concrete a foot and a half in thickness and from 6 to 8 feet square. Each pair of concrete piers is braced by two 2-inch round-steel rods, which are crossed in making the span between the piers. The inner corners of these towers are located upon concrete foundation blocks which, in turn, are placed directly into the earth.

Single-Phase Motor Construction and Characteristics

First Half of an Article Dealing with the Distinctive Features of the Various Classes of Single-Phase Motors--- Straight, Split-Phase, Shading-Coil and Compensated Types

By H. WEICHSEL and TERRELL CROFT.

SINGLE-PHASE MOTORS of the types ordinarily manufactured and used in power practice may be arbitrarily classified into four different groups as shown in the table below. No attempt is made herein to consider single-phase railway motors. Other classifications can be made which may, for some purposes, be preferable to the one shown. No generally adopted standard of classification is available at present. However, it is understood that the Electric Power Club and other electrical societies are co-operating in an endeavor to compile a classification of single-phase power motors which will, doubtless, ultimately be adopted as a standard classification in this country.

The Straight Single-Phase Induction Motor.

A single-phase induction motor pure and simple (classification 1*a* in the table) develops no torque when its rotor is not revolving. However, if the revolution of the motor is started by some means or other, there is a certain interaction of magnetic fields whereby there is exerted on the shaft a continuous turning effort. While a single-phase induction motor may be started by hand by giving the rotor a twist, obviously such a method of starting a motor is not feasible for commercial machines, hence other methods whereby the motor can be started automatically are adopted in practice. All of these methods of automatic starting (except that using a shading coil) involve electromagnetic interactions of some sort which occur, with the so-called straight induction motors, only during the starting period. In this discussion, when a straight single-phase induction motor is referred to, the term is used to designate one with a squirrel-cage rotor. After the motor is started it then operates as a single-phase induction motor, pure and simple. These methods of starting may be classified thus: (1) split-phase method, (2) shading coil.

Classification of Commercial Single-Phase Motors.

General type.	Subclassification.	Commutator.	Rotor.	Speed characteristic.	Examples.
1—Induction.	*a*—Straight induction or non-compensated.	No commutator.	Squirrel cage.	Constant speed.	Nearly all fan motors.
	b—Compensated induction.	In use for starting and running.	Combination squirrel cage and D.C.-armature type.	Constant speed.	Wagner type BK.
2—Repulsion.	*c*—Straight repulsion.	In use for starting and running.	Direct-current armature type.	Variable speed.	Wagner type BH.
	d—Repulsion induction.	In use for starting and running.	Direct-current armature type.	May be either constant or variable speed.	Gen. Elec. RI, const. speed. Gen. Elec. BSS, var. speed.
3—Repulsion starting and induction running.		In use during starting period only.	Direct-current armature type.	Constant speed.	Wagner type BA. Gen. Elec. RSA. Century type P. Peerless.
4—Series.	*e*—Unneutralized.	In use for starting and running.	Direct-current armature type.	Variable speed.	All universal motors for use on A. C. and D. C.
	f—Neutralized.	In use for starting and running.	Direct-current armature type.	Variable speed.	Kimble.

In the split-phase method of starting a single-phase induction motor, the motor, Figs. 1, 2, 3 and 4, is in practice provided with two distinct windings called the starting and the running windings (A and W, respectively, in Fig. 3). The starting winding circuit is so arranged that it has considerably more inductance, resistance or capacity—usually resistance—than has the running winding. Furthermore, the starting winding is displaced in the stator by 90 electrical degrees, as shown in Fig. 3, from the running winding. Due to the excess of inductance, resistance or capacity, the current

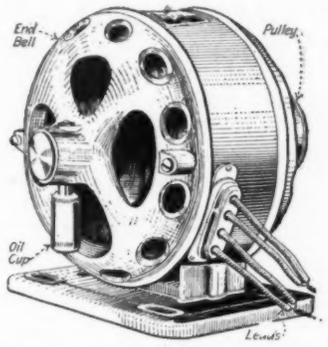


Fig. 1.—Typical Construction of a Split-Phase-Starting Single-Phase Induction Motor.

in the starting winding will differ considerably in phase from the current in the running winding. Because of this condition, and of the relative positions of the two windings, a rotating field is produced in the motor during the starting period, somewhat similar to the rotating field produced in a two-phase induction motor.

In practice the running winding, Figs. 3 and 4, usually consists of a considerable number of turns of large wire, well distributed over the stator. Practically all of the split-phase motors on the market use a starting-winding circuit of high resistance. Hence, the starting winding ordinarily consists of fine wire, thus giving this winding a high resistance. In fan motors of some designs an inductance coil mounted in the base of the motor is connected in series with the starting winding to provide the necessary inductance.

The running winding remains in circuit at all times when

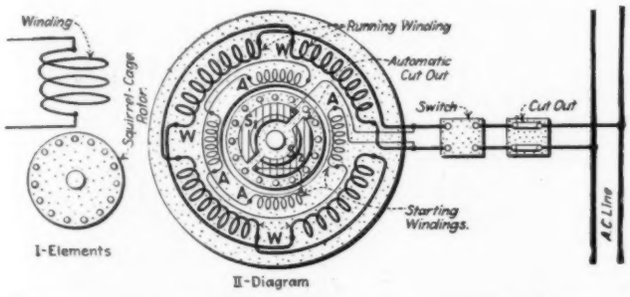


Fig. 3.—Diagrams of Straight Single-Phase Induction Motor.—II Shows Split-Phase-Starting Type.

the motor is in operation. But the starting winding remains in circuit only until the speed of the rotor approaches synchronous speed. When this speed is attained then the rotor winding should be cut out and an automatic centrifugal switch (Fig. 4 and S_1 and S_2 in Fig. 3) operates. This opens the starting circuit and then the motor continues to operate as a squirrel-cage induction motor, solely by virtue of its running winding and circuit and its squirrel-cage rotor. In small single-phase induction motors of certain manufacture, the squirrel-cage element is arranged in the stator and the running and starting winding are arranged on the rotor.

The principle of the split-phase method of starting is illustrated in Fig. 5, which shows an explanatory diagram and not a commercial motor. In starting one of these motors, firstly the main switch M is closed, which excites the running winding W. However, with only this running winding excited, the motor will not start of itself; but if now the starting switch S is closed, which energizes the starting winding A, which has in series with it the resistance R, the rotating-field effect referred to above is thereby produced in the machine and the rotor will commence to revolve. When the motor attains a speed which approaches synchronous speed, the switch S may then be opened and the motor will continue to operate as an induction motor.

The split-phase method of starting induction motors is

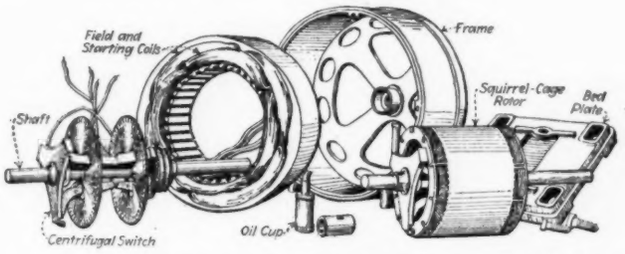


Fig. 2.—Exploded View of a Split-Phase-Starting Single-Phase Motor.

used only for motors of small capacity. Most of the induction fan motors and the fractional-horsepower motors employ this method of starting. However, the repulsion method of starting described below is now being used to some extent for starting fractional-horsepower motors because of the more desirable starting characteristics which it affords.

As to the starting torque, starting current and speed regulation of single-phase, phase-splitting-starting induction motors, they are suitable for applications for which the starting torque required is not over 150 per cent of full-load torque. The starting current for a motor designed to develop 150 per cent full-load torque is approximately 550 per cent of full-load current. The maximum torque is from 200 to 250 per cent of the full-load torque. The speed regulation from no load to full load is good, in fact, better than with the poly-

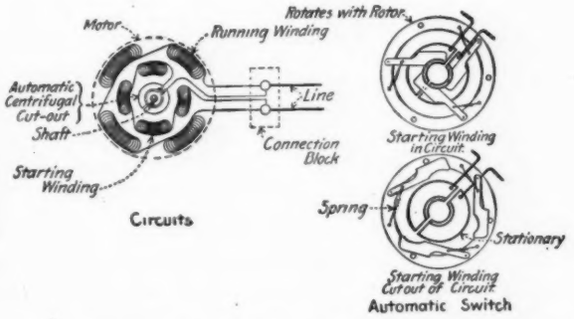


Fig. 4.—Automatic Switch for Split-Phase-Starting Type of Motor.

phase motor. In general, however, the efficiency, power-factor and maximum torque are not as good as in corresponding polyphase motors. They are suited only for driving machinery requiring relatively small starting torque.

The condenser-compensator method of starting single-phase induction motors (Fig. 6) is an example of the split-phase method of starting whereby permittance or capacity (capacitance) is introduced in the starting circuit. The rotor is of the squirrel-cage type. Two terminals (A_1 and B_1, Fig. 7) of the stator winding, which is essentially similar to a standard three-phase winding, are connected to the supply

mains. The third terminal C_1 of the stator winding is connected to the line through a transformer as shown in *I*, or through an autotransformer or compensator, as shown in *II* of Fig. 7. The main to which the lead from the transformer or autotransformer is connected is determined by the direc-

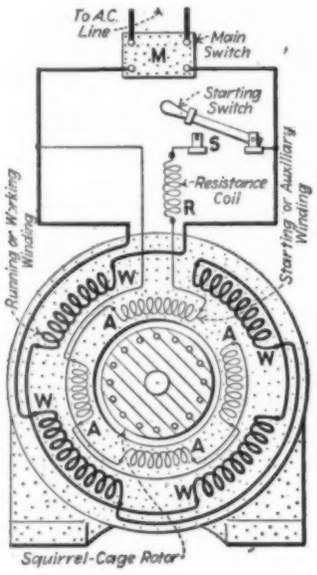


Fig. 5.—Straight Single-Phase Motor with External Starting Resistance.

tion of rotation desired. A condenser or permittor P_1 is also connected across the autotransformer, as shown in the illustration, to provide permittance or capacity. The motor is started with both switches *M* and *S* closed, but when it has attained a speed approaching synchronism, the starting winding is cut out (by operating the switch *S*) and the motor then continues to operate on the running winding only. This method, which is due to Steinmetz, is seldom if ever now used commercially but is of theoretical interest.

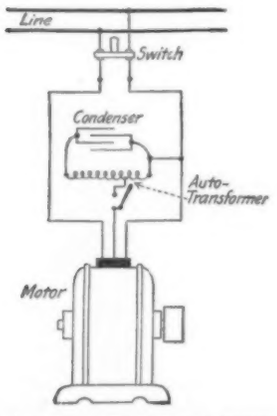


Fig. 6.—Single-Phase Self-Starting Induction Motor with Condenser-Starting Arrangement.

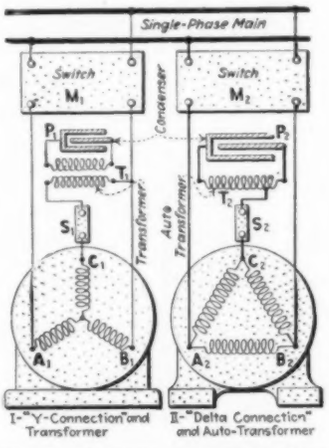


Fig. 7.—Diagrams of Split-Phase-Starting Motors Utilizing Capacity in Starting.

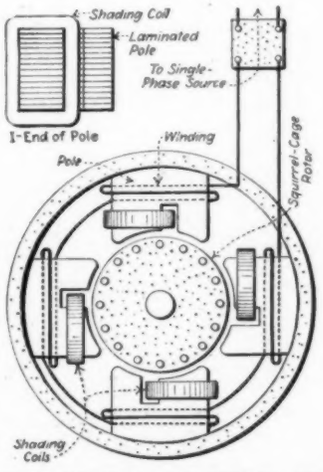


Fig. 8.—Application of Shading Coils in Single-Phase Motors.

Shading-Coil Method of Starting.

The shading-coil method of starting induction motors is illustrated in Figs. 8 and 9. The face of each pole of a machine which has been designed to be started by this method has arranged in it a small short-circuited copper-bar winding called a shading coil, which encircles a portion of the pole. When the alternating flux passes through the pole, it induces a current in the shading coil *S*, Fig. 9, which by virtue of Lenz's law tends to oppose the flux in portion *B*, which produces it. The result is that the flux in the "unshaded" portion of the pole, *A* in Fig. 9, attains its maximum at a different time than does the flux in the "shaded" portion *B*. Furthermore, as *A* and *B* are also displaced in space against each other, the result is that a field, which approximates in its effect the rotating field of a polyphase motor, is produced, but this "shifting" field is not as effective as that developed in split-phase machines. The method has the further disadvantage that the shading coil is always in position on the pole and that it involves an energy loss so long as the motor is in operation. However, the method is applied only in machines of very small capacity, such as fan motors, so that the energy loss is not a matter of great consequence. The use of this method is constantly decreasing.

Performance data for single-phase induction motors of capacities of from 1 to 50 horsepower will be found tabulated in the author's "American Electricians' Handbook." The efficiencies, per cent slip, pull-out torque and also the efficiencies and power-factors at various loads are there given.

Compensating and Neutralizing Windings.

A compensating winding on an alternating-current motor (*C* in Fig. 10) is, as the term is used herein, a winding the function of which is only to improve the power-factor of the current taken by the machine. Thus, the power-factor of an alternating-current motor may by the addition of a sufficiently powerful compensating winding be raised from lagging to unity power-factor or to leading power-factor, if desirable. All uncompensated alternating-current motors draw lagging current from the line. This means that they require greater currents than are actually necessary for the production of the power which they develop. But by using a suitably designed compensating winding it is possible to raise the power-factor of the motor current to unity and thereby proportionately decrease the current required for the production of the power.

A neutralizing winding, as the term is here used, is one the main function of which is to neutralize armature reaction. Hence, if a neutralizing winding is placed on a machine it will increase its output over that of the same machine without the neutralizing winding and incidentally it will improve the commutation.

Compensated Induction Motor.

The compensated induction motor (classification 1*b* in the table) is essentially a squirrel-cage-rotor induction machine to which have been added a compensating winding on

the stator and a direct-current armature winding and commutator on the rotor. Brushes and connections for the compensating winding are provided, as shown in Fig. 10, and there also are provided two short-circuited brushes E_1 and E_2, which contribute partly to the mechanical output of the machine. These brushes E_1 and E_2 and the connecting bar between them are not essential to the machine's operation, but they increase its efficiency.

The feature of machines of this type that has brought them into use is that they operate with good power-factor under all load conditions. They have the further advantage that, except in starting, practically all of the work is done by virtue of the squirrel-cage winding, hence the brushes and commutator carry little load current, commutation difficulties are minimized, the life of the commutator is increased and its size decreased.

The squirrel-cage winding consists of copper bars (shown as *C* in the section of Fig. 10-*II*) wedged in the bottoms of the slots in the rotor. A "magnetic bridge" *I* of iron is arranged above the squirrel-cage-bar winding and then the commutating winding, which is similar to a direct-current armature winding, is placed in the slot above the bridge. Fig. 10-*III* shows the connections as they exist after the machine has attained running speed. While the machine is starting, the compensating winding is not in use because its circuit is then held open by a centrifugal switch which is located within a casing at the shaft end. These machines are manufactured by the Wagner Electric Manufacturing Company and have a starting torque equal to one and one-half to two times full-load torque. Their starting current is about three times full-load current. When the machine is in running connection, the full-load power-factor is about unity. The adjustment of the compensating winding is so made that at full load the power-factor is approximately unity, while at no load it is usually appreciably leading.

The other classes of single-phase motors will be considered in the second half of this article.

(To be continued.)

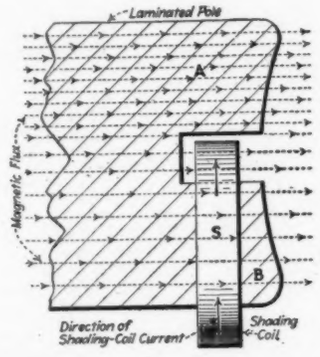


Fig. 9.—Illustration of Principle of the Shading Coil.

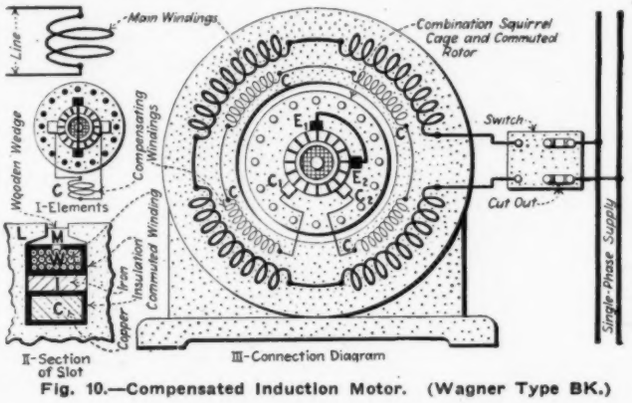


Fig. 10.—Compensated Induction Motor. (Wagner Type BK.)

Utility Companies Not Required to Make Extensions in New Jersey.—The Board of Public Utility Commissioners, New Jersey, has recently handed down a decision in favor of the Eastern Pennsylvania Light, Heat & Power Company in connection with a requested extension. In this, the board says: "Certain local conditions may exist that would make it unduly burdensome upon the operating company to make extensions in its plant equipment without some estimate or assurance of the probable consumption from the consumer for a comparatively limited period that might be taken as an index of the prospective earnings from such extension. The mere fact of having corporate rights within a borough is not of itself a sufficient reason why a public service company should be required to extend its service on the application of a prospective consumer."

JOVIAN ORDER PROVIDES NEWS SERVICE FOR LOCAL LEAGUES.

New Special Publication of "Ginger" to Be of Service for Electrical Leagues.

Under date of May 1, the central offices of the Jovian Order, inaugurated a new service to the chartered leagues of that organization. The title of the service which is in circular form is "Ginger." Its object is the distribution of information gathered from various sources to the chartered leagues for their guidance in the operation of their local affairs and in movements beneficial to the electrical industry.

The information contained also outlines various features pertaining to civic movements that have proved successful and beneficial in different localities; thus making the experience acquired in one locality available to members of the Order at other points.

In fact, the fundamental principle upon which the service is based is that of a clearing house for ideas, plans and experiences.

Being in close touch with its numerous leagues, the central office of the Order is in a position to keep close tab on all movements inaugurated; to analyze the course of procedure pursued and the results obtained, in such a manner that features proving beneficial may be determined from those that have failed.

In this way the service will give to each league the benefit of the ideas and the experiences of all other leagues—a service that could not be obtained from another source.

Although a great deal of this information has been collected by the central office of the Order, it has heretofore only been distributed on request. By making its distribution a regular semi-monthly circular service it will no doubt have a great effect in stimulating the activities of the leagues of the order.

The first installment of the service is a complete and comprehensive outline of league organization and operation, covering the selection of officers, methods of financing, promoting interest, publicity and many other important features.

Wires Underground in Frankfort, Ky.—An ordinance has been passed by the City Council of Frankfort, Ky., which requires all the companies operating in that city and maintaining wire systems to put their wires on sections of Main and St. Clair Streets underground and retire to the alleys for the lines in the residence districts. Two telephone companies, two telegraph companies, the lighting utility and the traction line are affected. It is stated that general opposition to the terms of the ordinance, which requires that the work be done before April 1, 1918, will result, especially in view of the cost. About a mile of the conduit construction work, it is said by engineers familiar with the town, would involve cutting a trench through limestone.

Effective Show-Window Lighting

The Show Windows of a Mercantile Establishment Can Be Made as Effective by Night as by Day by Proper Consideration of the Principles of Good Illumination—New Effects Possible by Special Control of Light Direction and Color

By H. W. MATEER.

THE SHOW WINDOW is an adjunct of recognized value in merchandising and should receive treatment in keeping with its commercial importance. A well dressed window is a work of art, and the window dresser who arranged it an artist. He employs color and material harmoniously arranged and depends on light to make the resulting picture effective. In the daytime the appearance of the window is limited to that which may be obtained under natural light, in which the color and direction are not controllable. At night the flexibility of artificial illumination permits unlimited variations in light direction, color, and intensity, and provides the window dresser with means of using material and color to produce a variety of beautiful effects.

In show-window lighting the fundamentals of good illumination apply as well as in any other branch of illumination. Not infrequently show windows are lighted by means of bare lamps suspended directly over the displayed goods and in the line of vision of the observer. While this was bad practice in the days when carbon and other vacuum lamps were in general use, now that Mazda C lamps with their intensely bright filaments are being used almost entirely for this class of service, this practice is all the worse and should not be tolerated.

The obvious and simplest method of avoiding glare is to conceal the lamps. This is most easily and satisfactorily done by locating the lamps, properly equipped with reflectors, along the top front edge of the window. If the window glass extends to the ceiling the units may be visible from the street. In this case a valance draped from the top of the glass may serve the double purpose of beautifying the window and concealing the light sources.

Importance of Considering Background.

A point often overlooked in show-window lighting is the proper consideration of adapting the window background to the illumination system. The background should be made so that specular reflection is either avoided or properly controlled; for glare due to specular reflection is often as annoying as that due to the presence of the light source itself. For instance, if a lamp is placed (as shown in Sketch *A*, Fig. 2) in a window with a polished background, such as a mirror or a polished wood paneling which extends from the floor of the window almost to the ceiling, the image of the source will be reflected into the eye of the observer as shown by the broken lines. If the background does not extend up so high (as in Sketch *B*, Fig. 2), little reflected light will strike the eye at its ordinary height. The same result can be secured by dropping a curtain between the light sources and a high background, as indicated in Sketch *A*, Fig. 2; or, if a high background is a necessary part of the display, it may be mat-finished so that the reflections instead

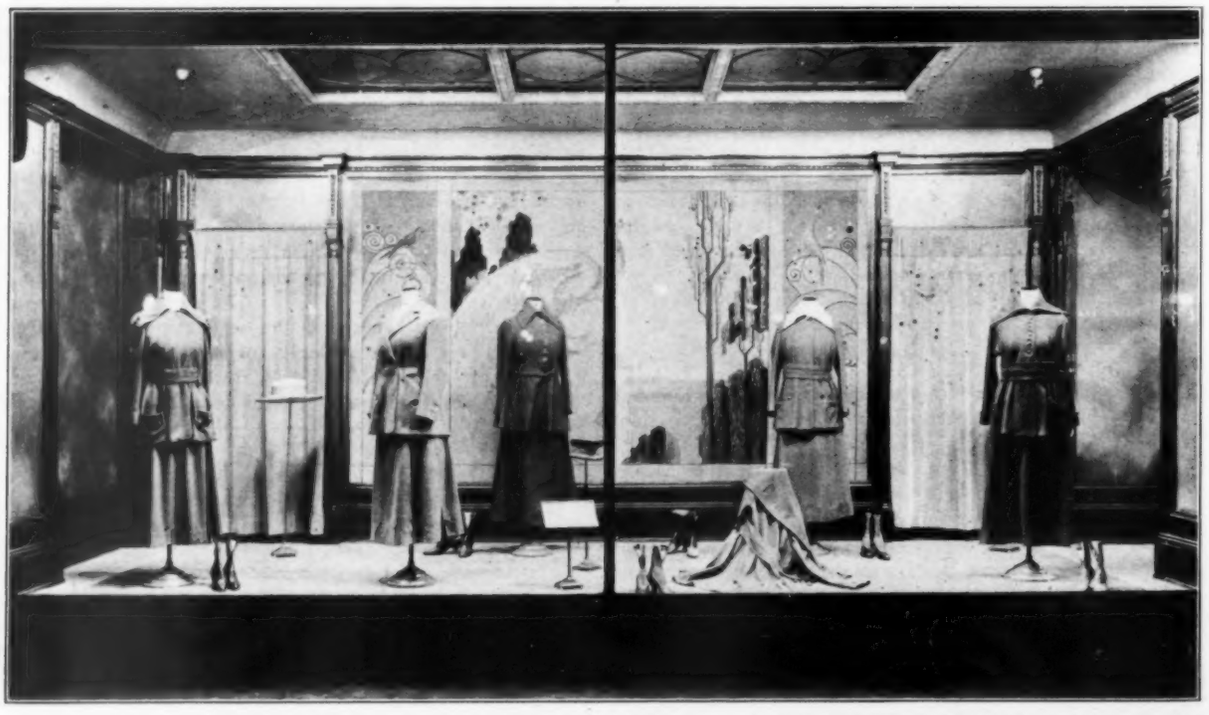


Fig. 1.—Excellent Lighting of a Show Window with Mazda C-2 Lamps Giving Daylight Effect. The Light-Colored Mat-Finished Background Increases the Apparent Intensity and Prevents Specular Reflections.

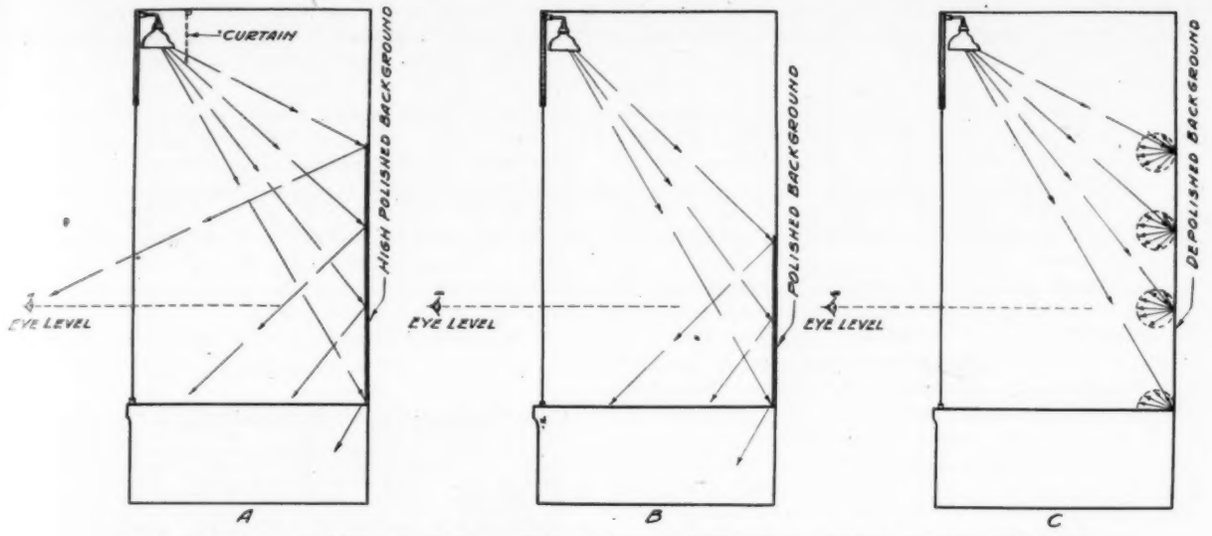


Fig. 2.—Diagrams to Show the Effect of Show-Window Backgrounds as Regards Specular Reflections.

of forming brilliant images will be diffused in all directions, as shown in Sketch *C*, Fig. 2. When light is reflected from mat surfaces in all directions the surface appears uniformly illuminated and no excessively brilliant image is formed to dazzle the eye.

Control of Light Direction.

In the present practice of window lighting it is too often the purpose to secure merely uniform illumination of the display without considering whether or not the presence of some shadow would make the display appear to better advantage. A certain degree of shadow is necessary in order that each part of an object may appear in its proper relation to every other part. Obviously the degree of shadow is controlled by the direction of the light. The different views in Fig. 3 show how the appearance of an object may be made to vary by changing the direction of the light that illuminates it. The photograph on the extreme right shows the flat appearance of the face produced by eliminating all shadow. While the above illustration only serves as an example of what can be accomplished on a small scale by the proper direction of light, the same principle can be applied to show-window lighting, and with displays where figures of three dimensions are shown the effects produced will be surprisingly pleasing. The additional equipment necessary consists only of a larger number of lamp sockets and a flexible control system. The location of the outlets should be such that light can be obtained from several directions.

Possibilities in Color Effects.

Color is, of course, one of the show-window dresser's most effective tools, yet full advantage is seldom taken of the possibilities of artificial lighting in the rendition of colors. The color contrast in a display depends, among other things, upon the color quality of the light which is used. A fabric is said to be red in daylight because it absorbs practically all the other colors in the spectrum and reflects mainly the red. Under a green or a blue light, in which red rays are absent, the same fabric would appear almost black. Mazda lamps give all the colors of the spectrum, but their light contains relatively more of red and yellow rays than does daylight. Hence, these lamps emphasize the reds, yellows and browns, and likewise fail to bring out the blues and violets in their proper weight. By the careful selection of color screens, however, any color may be given emphasis.

Thus, for instance, if it is desirable to emphasize the whiteness of goods on display or to bring out the blues in dressgoods a color screen should be used which will absorb a part of the excess red and yellow rays while freely permitting the others to pass. Blue-green glass of the proper selection will do this, but if correct color value of the light and a high efficiency are to be obtained a thorough knowledge of color must be used in the selection. Lamps designated as Mazda C-2* lamps have been developed, which, through the effect of special coloring elements mixed with the ingredients of the glass from which the bulbs are blown, give a light of afternoon sunlight quality at about the efficiency of the Mazda B lamp. The lamp manufacturer has placed the proper color in the bulb instead of depending on auxiliary equipment, since other glass having the same appearance as that used in Mazda C-2 lamps might, to the user's disadvantage, transmit light of very different color value.

Color variation is, perhaps, the most effective means of holding attention. A florist's window, for example, can be made to change wonderfully by simply changing the color quality of the light which illuminates it. If it is lighted entirely by a white light, such as is obtained with Mazda C-2 lamps, the whites, blues, greens and violets will appear to stand out because the reds, yellows and browns with which they are contrasted will be depressed. If the color quality of the light is made to change by adding to the white light, brown and yellow light from amber-colored bulbs, the colors that first appeared prominent will appear to fade and the yellows and browns will be given prominence. Again, if red light is added to the white light, the effect will be to make the contrasts between red and the other colors more marked.

Such effects, as mentioned, may be readily secured by having available in the window the colored lamps necessary. The changes from one color to another may be made by a suitable flashing device and may be sudden and contrasting, or they may be gradual and harmonious. The colors in rugs, dressgoods, wallpaper, pictures, paintings, etc., are susceptible to the same treatment. A window dresser who will make a study of the possibilities of colored light as well as the possibilities of light direction will be able to produce beautiful and unusual effects.

The Intensity Necessary for Effective Lighting.

The intensity required for show-window lighting depends largely on the brightness of the surroundings. Show windows located on "white ways" will require a greater

*The Mazda C-2 lamp should not be confused with the Mazda C-3 lamp, which is designed especially for photographic purposes. Although both have the blue bulb, they do not give light of the same color quality.

intensity than those located on a dark side street. However, as light is one of the most inexpensive and effective means of advertising, an intensity higher than is absolutely necessary for suitable lighting can usually be employed to advantage. Another factor which must be considered in determining the intensity is the color of the display. An object is seen by the light which it reflects, and, therefore, dark-colored displays require more light than do those of lighter colors. Since the display of a show window is frequently changed both in material and color, the flexible arrangement of lamp sockets suggested for securing directional lighting effects offers a method of varying the intensity at will. In general the intensities for window lighting range from 10 to 50 foot-candles.

The advantage of using reflecting equipment in show-window lighting should be generally understood. When lamps are used without reflectors a greater part of the light falls on the walls, background and ceiling before it reaches the display. Usually window backgrounds and ceilings are poor reflectors and much of the light, which by the use of reflectors could be utilized, is lost. The most satisfactory reflectors for window lighting are the prismatic and the mirrored glass. These reflectors afford good control of the light with a high efficiency.

In lighting a show window the first question is usually one of how much light is needed. The statement that so many foot-candles are required is only of value when the equivalent is given in wattage. Many times the amount of light required is expressed in watts per square foot of the window floor. While this designation is satisfactory for windows in which the display covers only the floor surface, it fails to do justice to those many windows where the displays cover a considerable portion of the background as well as the floor. In other words, the floor space of a window is not the only consideration which enters into the determination of the wattage necessary to light a window properly.

Simple Method of Calculating the Lamp Equipment.

The following is a simple method of finding the intensity suitable for any show window regardless of the display arrangement. This method is based on the efficiency of Mazda C lamps and of prismatic or mirrored-glass reflectors. For the purpose of calculation show windows may be divided into ten classes on the basis of intensity of illumination desired. Class 1 includes those windows in which the lowest standard of illumination will be permissible—an intensity, in fact, which would not be adequate in most cases. Class 2 includes the average country store, where a low intensity is sufficient. Classes 3 to 6 cover the average store; Classes 7 and 8 the department stores of most cities. The finest windows of the largest stores and exclusive shops located on brightly lighted streets fall in Class 9 or 10, representing the highest intensities which can be used to direct advantage.

The first step in the calculation is to place the specified window in one of the ten classes. The next step is to add the depth of the window, in feet, to the height of the lamps above the window floor, in feet, and multiply this sum by the class number of the window. The result will give the required watts per running foot of window frontage, assuming that 100-watt Mazda C lamps are to be used. To get the number of lamps necessary the number of watts per running foot of window frontage should, of course, be multiplied by the window frontage in feet, and this result divided by 100. Should the window be other than rectangular in shape the length of the window frontage should be taken as the average of the length of the actual window front and the length of the window background.

This method of calculation as described applies only where windows are to be lighted by a direct system using well designed mirrored glass or prismatic reflectors placed at the top of the window. Where Mazda C-2 lamps are to be used, since the 150-watt C-2 lamp gives approximately the same intensity as that of the 100-watt Mazda C lamp, due to the absorption of light by the colored bulb, the number of units to be used is the same in either case.

Fig. 4.—Window Quite Well Lighted, Except that Visibility of Reflectors and Specular Reflection in the Polished Surface of the Upper Background Detract from the Effect.

Henry L. Doherty Advocates Night Freight Hauling by Electric Railways.—Night freight hauling by electric railways can be made a material factor in reducing the cost of living, according to Henry L. Doherty, and he has instructed the managers of the various Cities Service traction properties to investigate the proposition as related to their local conditions. Mr. Doherty recently returned from extended visits to Toledo, Kansas City and other middle west points, convinced of the feasibility of his plan. The primary move to make the idea a success, he thinks, would be the starting of an extensive educational advertising campaign in each city available, which would tend to show the public the benefits of the innovation, and consequently pave the way for legislation necessary to amend franchises not permitting this form of traffic.

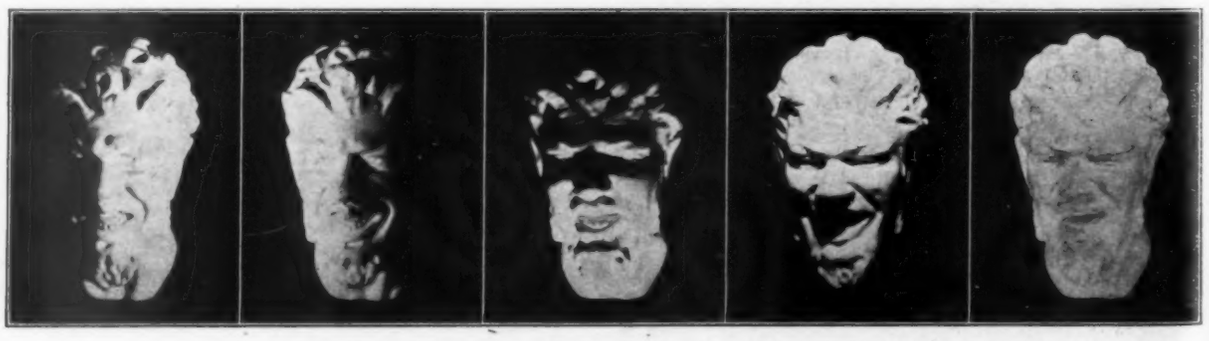


Fig. 3.—Views of a Statue Face Illuminated from Different Directions.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

Proposed Rates for Louisville to Encourage Farm Installations.

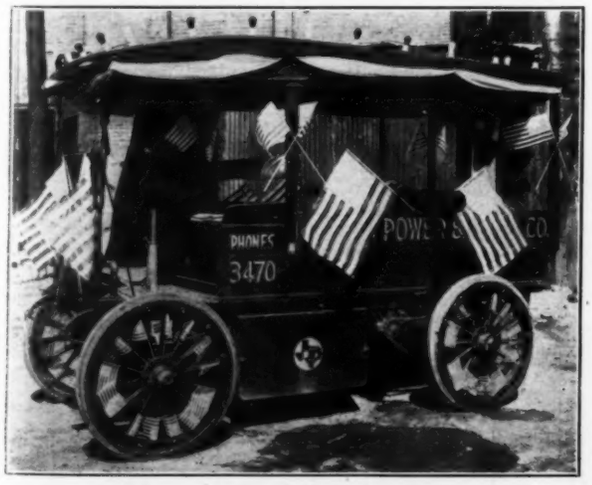
Responses from customers of the Louisville (Ky.) Gas & Electric Company to its proposal for reduction in domestic rates to a power-rate basis, after a certain minimum consumption, have been numerous, considering that there has been no advertisement of the proposal as yet. A mere statement of the proposal in the news columns of the papers produced the results. That the developments are in the direction desired by the company is shown in the fact that many of the requests for application blanks for signatures of the customers were accompanied by statements that it was proposed to make use of heating and power appliances. The company will begin an advertising campaign on the proposition in the near future, using the backs of the monthly bills, etc., in disseminating the information.

One of the results of the new rates will be to make use of motor equipment especially attractive to the farmers located on the lines of the company. The service lines to the suburbs pass many farm homes of which many are wired, and the advantages of motor power for many of the farm appliances will be made available to these farmers.

Electric Truck in Preparedness Parade.

The Waco branch of the Texas Power & Light Company never misses an opportunity to show the people that the company is interested in all local enterprises and always ready to co-operate in making things go.

The accompanying illustration of the company's electric float, which occupied a prominent part in a patriotic



Electric Truck in Waco Parade.

parade recently held in that city, exemplifies the spirit of the company. The truck was decorated with flags and bunting and around the top were small red, white and blue lamps lighted from the batteries on the truck. The employees of the company, each carrying an American flag, marched behind the truck and from the expressions heard along the line of march the people appreciate the company spirit.

EXTENSION OF SERVICE BY PUBLIC UTILITIES.

An Abstract of a Report Presented Before the Recent Convention of the Southwestern Gas and Electrical Association.

By R. J. Irvine.

The growth and development of any utility will depend, to a great extent, on its plan or policy in regard to the extension of its service. Just what will constitute the most profitable course to follow will depend upon existing and particular conditions applicable to the utility in question. There are various conditions that may accrue which will control the advisability of making extension of the service lines or mains. Some of these items to be considered are:

(1.) Statutory, commission, ordinance or franchisal conditions with reference to compelled extensions.

(2.) Cost of material and labor in desired extensions.

(3.) Gross and net returns from the extensions.

Before an extension of service is finally decided for or against, the new territory should be plotted and thoroughly canvassed, contracts for service obtained where possible, and all future business conservatively estimated. After this information is obtained it will then be advisable to make estimate of gross revenue and cost of making necessary extension. It is often taken for granted that all new business is desirable and extensions are often made, which in the end prove unprofitable and a burden rather than a good investment. It is therefore a safe practice to go very carefully into the matter of costs, expense and revenue before a hasty decision is made.

If, on such a survey, the investment and operating is believed to be too great to afford a proper return, either at once or in the near future, the next matter to determine is as to whether such an extension can be enforced by the public. If there are city ordinances or franchise agreements or State laws or State court decisions under which the company can be compelled or coerced to make an extension involving a present or prospective loss, then there are only two things to do—either make extension as quickly and cheerfully as possible or else to take the matter into the courts or before a utility commission, if you have one.

Some few courts have held, as a point of law, that when a public utility company obtains a franchise to serve a particular territory or area (such as the incorporated limits of a city), it obligates itself to serve all who live within that territory or area. The enforcement of this view would in many instances mean "confiscation" of perhaps not only the profits of the utility, but also of its property and therefore even the extremists in this view have modified it to the extent that, in cases when the construction and operation of the extensions would entail a loss to the utility, it would require the individuals who would be benefited by this extension to forefend the utility against actual loss. This may be done by some form of security, such as a bond or deposit, or by a monthly payment in addition to the payment for the product or services rendered.

The basic principles of this matter of extensions is one which may be made the touchstone in nearly every other case

involving public utility service, viz.: the utility is legally and equitably entitled to make its authorized, agreed or permitted "return" or profit as long as it gives a "local 100 per cent service"; and such return or profit must be made, as nearly as is commercially possible, in equal ratio from every consumer. On this basis, no one has the right to ask or compel the utility to give them service at even a loss of profit, much less at an actual loss.

Beyond this matter of equity there comes, however, the question of "policy." It may be good policy or good "public policy" for the utility to make certain extensions and operate them at a loss of profit or of a portion of the profit, but, in such cases, it must be careful that the loss does not exceed these limits or that it does not try to recoup itself for this particular loss of profit by an inequitable increase of profit in other directions.

Quite often such an extension, while a losing investment at the minute, may be believed to promise a development which will be profitable later on. In such case, both courts and commissions have held that the compelling of such an extension is warranted if ordinary practice and experience shows the probability of such an extension becoming profitable. Also, the courts and commissions have held that where those who expect to immediately benefit by the extension believe that it will eventually become profitable, they may compel the extension by a payment or by security or bond to that effect, this payment or security or bond to be reimbursed to them whenever and to the extent that the extension does prove profitable.

These conditions are equitable, the utility has to take some chances in its service extensions; it cannot expect to always "play a sure thing." It must not expect the community to guarantee its full profit, that must be a matter of its own efforts. All that it can ask is that no action of the public, or of that public's public representatives, shall be such as to forcibly reduce the "reasonable return" to the utility so long as the utility gives a local "100 per cent service."

Moreover, there is always the commercial point to be kept in mind that what would be a fair and reasonable return on extension of service lines will depend to a considerable extent on the effect of such additions on the operating ratio; on the class of business being added will depend to a great extent the amount which it will be advisable to spend to obtain additional business. It is often easy to obtain business that has such demands on the station and equipment as to make it undesirable, although the rate of return on the necessary extension would be entirely satisfactory. Again, sometimes by making what would appear to be an unreasonable extension, you may obtain a customer who will have a small demand during peak load and very materially improve the load-factor of the station and distributing system, and prove an exceptionally good interest, although if figured merely from a standpoint of dollars invested to increase gross receipts it would not look at all attractive, and where there is occasion to doubt the advisability of making extension, the permanent effect of such additional business should be considered from its various angles.

Cost of Labor and Material Must Be Considered.

Cost of labor and material will naturally affect the advisability of extending lines and service. If extensions are made during high market conditions, the fixed charges will be much higher than if extensions were made during normal purchasing conditions, and if in the future these extensions should be appraised at the normal value for rate-making purposes or otherwise, extensions made during such times, will, to a certain extent, overburden the property during normal times. Again, if such extensions are not made, development may be retarded, which condition might also be detrimental to the best interest of the utility and the community.

It may be pretty well taken for granted that the courts will not uphold any attempt to force an extension of services, the construction and operation of which will compel a loss to the utility and which loss is not repaid at the time it occurs or is not secured by deposit, or bond.

It is also pretty certain that what the court will look to is the "final loss." If it appears reasonably certain that the extension will finally become sufficiently profitable to pay reasonable return on the investment, the tendency of the courts seems to be to compel the construction and operation of such extension. So far as can be ascertained there has been no higher court decision on this matter in this state; therefore, if a case of this character were taken up before the courts of this State it is exceedingly probable that they would be guided by the decision, in other States, of either or both the courts and the public utility commissions and there are a large number of these decisions and rulings of the character as stated above.

NEW TYPE OF STREET LIGHTING IN BROWNWOOD.

Texas Town Installs Lamps Under Awnings and Window Lighting Is Also Improved.

A new and attractive method of street illumination has recently been put into effect in Brownwood, Texas, a town where the electric property is operated by the Texas Power & Light Company. This is a town of about 12,000 population and is typical of the ordinary Texas town of this size. Effort has been made for some time to arouse interest in a "White Way" lighting system in Brownwood, but the general plan of the business section and the consequent cost of such a system has offered difficulties to putting through such a plan.

Finally it was decided to try an entirely different method of illuminating the business section. The store buildings in Brownwood have, with very few exceptions, 25-foot fronts, and it was decided to wage a campaign among the various merchants and property owners to install lamps under the awnings on 25-foot centers. In practically every case this amounts to placing a lamp under the awning in front of each store entrance. A standard unit consisting of a 100-watt, Type C, lamp inclosed in an opal ball and hung from a weatherproof holder was decided on and this was used uniformly throughout.

Inasmuch as the success of the plan meant much to Brownwood, the commercial organizations in the town were appealed to and the idea met with instant response. Personal calls were made on all the merchants and the plan was outlined to them. It was the understanding at the start that the system would not be put in on any block unless the entire block could be uniformly lighted. The company was to install and maintain the system and a flat rate of $1.40 per month, less 10 per cent discount for prompt payment was to be charged. In the majority of cases the men approached were easily convinced that the plan meant much for them individually and for the city as a whole and signed agreements on the first interview.

As a result of the campaign, which was heartily supported by the local newspapers, three-year contracts for almost 400 lamps were secured, totaling an annual revenue of over $5,000 a year.

Window Lighting Also Improved.

As the system was being installed interest was maintained by means of frequent items in the daily papers with a result that it was decided to hold a big celebration at the time the system should be lighted for the first time. Inasmuch as the Mid-Texas Mothers' Congress and the Mid-Texas Teachers' Association were to meet in Brownwood about the time the completion of the white way was scheduled it was decided to hold a "Style Show" at this time.

Immediately after this had been decided the same salesmen who had been working on the white way turned their attention to window lighting and since the time was op-

New Type of Street Lighting With Lamps Under Awnings.

portune quite a number of effective show-window installations were made. Illustration of one of these is shown.

The merchants vied with each other in having the most attractive displays with a result that the windows were brightened up as never before

The style show proper was held in one of the theaters where all the new styles were shown on living models. Complimentary tickets were given to the visitors. Tickets sold to the home people brought a revenue of several hundred dollars which was given to the local charity association.

It is needless to say that the visitors were greatly impressed with the city-like appearance of the town and the value of the advertising thus secured can hardly be estimated. As a direct result several of the merchants in neighboring towns have brushed up their windows, put in new lighting installations and are keeping the windows lighted after dark.

The work was in charge of Manager Murphey of the Brownwood district of the company, and J. G. Barrett, illuminating engineer, for the company. The plan will be carried out in other sections where the company is operating.

Large Trucks Make Good in Heavy Hauling.

Boston transportation people are watching with interest the performance of a very large General Vehicle Company electric truck built for a hauling company which uses the truck for the delivery of paper to a number of the daily newspapers. The average performance is about 30 miles a day, with eleven rolls of paper, weighing about 1100 pounds each, to a load. The truck is doing the work of two three-horse teams, and frequently more.

It has been found conclusively that the truck is more economical than the horse equipment, and the haulers have ordered a second truck of like description. Features that commend themselves to the hauling concern are the simplicity of operation, the quick "get away" at the traffic officer's signal, and the quick "backing in" time.

New Use for Electric Light Projectors.

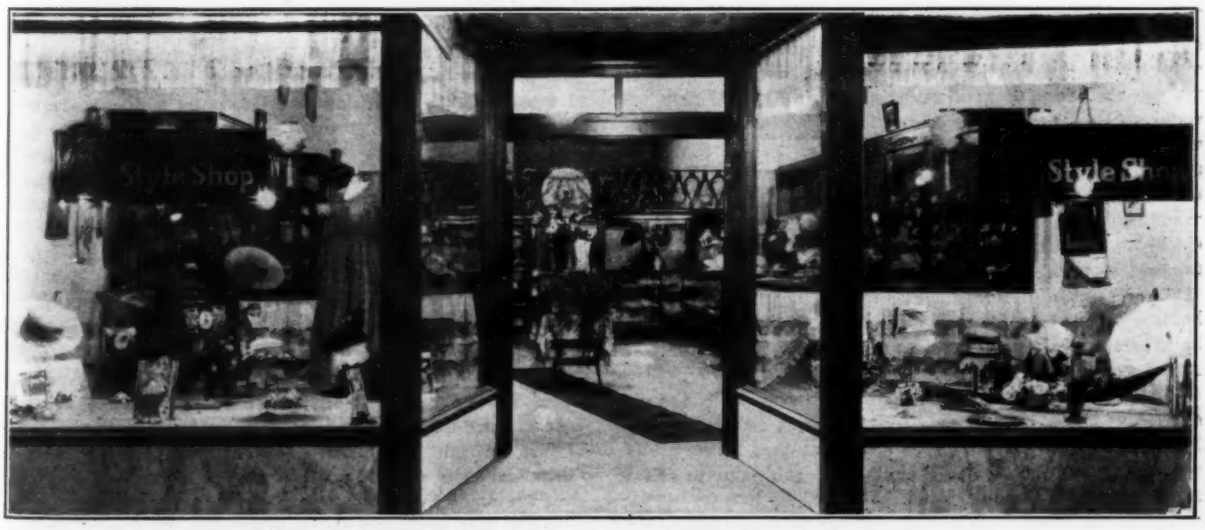
Robert Montgomery, commercial manager Louisville (Ky.) Gas & Electric Company, has issued the following bulletin to salesmen calling attention to the new use for electric lighting projectors:

"A few days ago one of the wiring contractors discovered another novel use for lighting projectors.

"A wedding was to take place in one of the large churches and the church was made as attractive as possible for the occasion. Back of the altar in this church is a very large art-glass window of most exquisite coloring and very beautiful design. Ordinarily the beauties of this window cannot be appreciated except in the daytime, when the sun is shining, for when it is dark the coloring in the design can hardly be distinguished.

"Therefore the contractor installed a large Type C projector in the rear of the church, and by focusing it on the art-glass window a most wonderful effect was obtained from the interior.

"Many churches and cathedrals have windows of this kind, costing thousands of dollars, which are rarely appreciated for the reason that their beauty is lost without light. Therefore if this arrangement is brought to the attention of some of the ministers a number of these projectors could probably be permanently installed for this purpose."



Improved Show-Window Lighting in Brownwood, Tex.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

PRELIMINARY REPORT UNFAVORABLE TO FURTHER CONSIDERATION OF CONCENTRIC WIRING.

Findings of the Committee on Bare Grounded-Return Wiring Systems.

When the concentric system of wiring was proposed a year or so ago as a means of wiring houses at less expense than is possible with the standard wiring systems employed in American practice, considerable discussion ensued as to the pros and cons of this system. The result was the formation of a committee of business and technical experts of the electrical industry, which later became the Committee on Electric Wiring Systems. In order to consider the merits of the proposed concentric and similar wiring systems more carefully there was later appointed by this committee a Subcommittee on Bare Ground-Return Wiring Systems, as announced in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of June 17, 1916.

This subcommittee has been continuing its investigations throughout the year, gathering all available data and results of actual experiences with concentric wiring systems in England and this country, and also experiences with other bare grounded-return systems, notably in Providence, R. I.

In its preliminary report to the main committee, the subcommittee cites the cost of some typical installations of concentric wiring in New York City, which showed that these costs were about 13 per cent greater than the most expensive type of standard wiring and about 35 per cent greater than the least expensive type. While greater production would reduce the cost of concentric-wiring material and greater familiarity with its installation would doubtless reduce the cost of labor, the committee thinks it "hardly seems probable that sufficient reductions could be expected to make these costs sufficiently below those of the least expensive installation of the standard type (with which the concentric system should be compared from the standpoint of value) to make the former attractive to the electrical industry." The committee also considered with much care the matter of grounding, the reliability of artificial grounds, and the hazards introduced when the ground connection is broken, deteriorated or otherwise rendered valueless. As the result of all this study, the conclusions of the subcommittee are as follows:

"(1) That the chance of securing by the use of bare grounded-return conductors a satisfactory system of wiring, which can be installed at sufficiently less cost than the present standard systems to make it attractive, is very remote.

"(2) That it is undesirable to make a connection between the noncurrent-carrying parts of fixtures or machines, and the grounded conductors of circuits, whether these conductors are bare or insulated.

"(3) That even if a system could be secured, by the use of bare grounded-return circuits, which was attractive from the standpoint of reduced cost of installation, such a system, under any conditions which the industry could hope to secure in the near future, would be likely to involve hazards to life and property, which would make its general use undesirable.

"The committee recommends, therefore, that it be discharged as having completed its work and that consideration of the subject of bare grounded-return wiring systems, with the idea of recommending their adoption, be dropped."

This report has, at the time of going to press, not yet been adopted by the main body, the Committee on Electric Wiring Systems. The members of the subcommittee presenting the report were: C. E. Corrigan, Pittsburgh, Pa., chairman; W. H. Flandreau, Mt. Vernon, N. Y.; J. C. Forsyth, New York, N. Y.; G. S. Lawler, Boston, Mass.; C. Renshaw, East Pittsburgh, Pa.; and W. S. Boyd, Chicago, Ill., secretary.

Peculiar Motor Trouble and Its Solution.

BY PAUL JUSTUS.

A fractional-horsepower exhaust fan used for carrying off the fumes and excess paint vapor in connection with a paint-spraying outfit gave trouble due to frequent burnouts of the armature shortly after being installed. The cause of the trouble was a mystery for some time, until someone suggested that possibly the accumulation of paint on the blades caused them to become unbalanced and their added weight imposed a heavier load. The blades were therefore cleaned at frequent intervals and the trouble disappeared. To facilitate removal of the paint the blades were dipped in hot paraffin after being cleaned so that the paint would not adhere very readily. Dipping the blades in hot water and lye made their cleaning an easy matter.

Heroic Bell Arrangement for a Deaf Tenant.

BY JOHN L. GLEASON.

A lady who is very deaf engaged an apartment in a six-flat building. Each apartment has a telephone connected to the vestibule, but she could not hear the bell so she asked me to put a cow bell in each of the six rooms to ring simultaneously with the telephone call. I knew that it would require so much battery current to put all these extra bells in multiple with the telephone bell that it wouldn't do the system any good, so I got a four-ohm relay and put it in multiple with the telephone bell, so that it would close a different set of batteries for the six extra cow gongs. The job pleased the old lady all right, but I haven't heard how the other five tenants are taking it, for it certainly is a bedlam there when button No. 3 is pressed.

Emergency Wire Terminals.

BY M. J. MORIARITY.

On small-motor and switchboard repair work I have had occasion at times to use emergency wire terminals in special places where the standard types would be hard to install. When I have a job of this kind I use a piece of copper tubing of just the right size for the wire to be connected and make a terminal to fit the job at hand. The terminals for all wire sizes are made by just flattening one end so that it is solder-tight and then drilling a bolt hole through the flat end for the size of bolt which is to connect the terminal.

New and Safe Clip for Connecting to High-Tension Live Lines.

By E. N. Horr.

Since it has become necessary for the continuous operation of high-tension lines to work on them while the current is on, there have been a number of devices brought out by different manufacturers which are designed to make the work safe and substantial.

The engineers of the Counties Gas & Electric Company, of Norristown, Pa., have developed a device for making taps or jumpers on live 13,000-volt lines which they believe to be an improvement on anything which has come to their notice. It utilizes the safe principle of the lock nut to secure good contact and permanency of connection without detracting from the speed of operation, safety of the operator, or compactness.

As shown in Fig. 1, the clip consists of two pieces of brass or copper, grooved to take any size wire, which are drawn together by a heavy screw and nut. The larger piece has its ends bent to afford a guide for the wire at one end and to allow for the angle of the lug at the other. Two light metal guides are secured to the sides of the smaller piece which serve to keep the two halves of the conductor slot in alinement, and also to act as a stop for the wire when entering the jaws formed by the two main pieces.

A lug, which is made from a piece of brass or copper tubing, is fastened to the end opposite the slot by means of two small bolts, and a hole about three-fourths-inch in diameter is drilled in the same end of the large plate. This hole is used in putting on and taking off the clips.

To connect a service to a live line or to make any other desired use of the clip, two paraffined wooden poles are used. These are about nine feet long and two to three inches in diameter, and are provided on the ends with a bolt and a deep socket wrench, *A* and *B*, respectively, in Fig. 2. The bolt is made long enough to hold two clips at once, and small enough to easily enter the hole in the larger brass jaw. The wrench is made to fit the nuts used on the main screw and deep enough to take two nuts at one time. The bolt and wrench are securely fastened to the poles, which are of light wood and easily handled.

In operation, two men climb the pole on which the work is to be done, one handling the wrench, the other the bolt. The second man puts the clip (to which the tap or service wire has been connected by sweating into the lug) on the bolt, and secures it by means of a loose nut. He opens the jaws of the clip far enough to enable him to slip it over the live wire, and pushes it over the wire until the guides on the movable jaw prevent further motion. The man with the wrench then puts his tool over the two nuts (which are not removed from the bolt) and secures the clip to the wire by turning them up tight. The bolt is then withdrawn from the hole, allowing the loose nut to fall to the ground, and the job is complete.

In the case of putting on a jumper, both ends of the jumper are sweated into the lugs and both clips held on the same pole to prevent the loose end from swinging into contact with another wire while the clip is being put on. The second clip is ready to be placed as soon as the first one is on, thereby doing away with the fumbling around with a pole that is none too well insulated.

This clip has been used with excellent results, both on permanent and temporary work, and provides a safe and speedy method of doing a ticklish job.

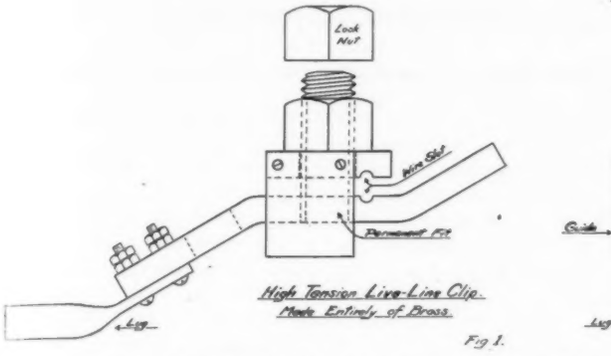


Fig. 1.—Front and Side Elevations of New Live-Line Clip.

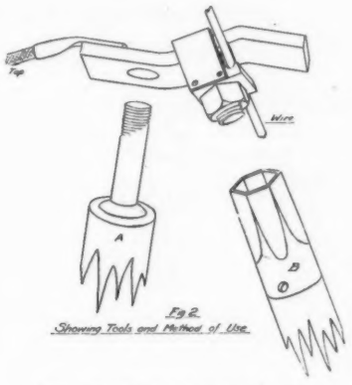


Fig. 2.—Method of Using Clip.

Among the Contractors.

The Arrow Electric Company, Seattle, Wash., received the contract for furnishing and installing the electric wiring in the new building of the Northwest Dairy Company in that city.

The National Electric Company, San Francisco, Cal., has received the contract for wiring the new building being erected at Pine and Broderick Streets in San Francisco.

Walter J. Coleman, 29 Willow Court, Jersey City, N. J., has received a contract for electrical work in the new addition to be erected to the Lincoln High School, Jersey City, at a cost of $6,650.

C. H. E. Williams, Seattle, Wash., has been awarded the contract for the electrical work in the Vulcan Iron Works plant at False Creek, near Vancouver.

The Douthie Electric Company, Bend, Ore., secured the contract for the electric wiring for the Spier Building being erected in Bond Street, that city.

Lloyd Garrett & Company, Philadelphia, Pa., have been awarded a contract for electric fixtures for the new Public Library at Indianapolis, Ind., at a cost of $15,000. Headquarters of the company are at 229 North Twenty-third Street.

Badaracco Brothers, 155 Fifth Street, Hoboken, N. J., have been organized to operate an electrical contracting business. Martin and Ernest Badaracco, 88 Park Avenue, are heads of the organization.

V. O. Davis and Samuel Goodhue are erecting a new building to house their electric shop in San Mateo, Cal.

Herman F. Haak has opened an electric shop in Clintonville, Wis., and will do contracting.

The firm of Bradford & Pennell Electrical Company, 320 Division Street, East St. Louis, Ill., has been dissolved, Mr. Pennell having disposed of his interest to Mr. Bradford.

New Electrical Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Ostrander Non-Adjustable Floor Box.

Facility in the use of electrical appliances is requiring an increasing number of wall and floor outlets. For the latter the floor boxes that are used, if of the adjustable type, are rather expensive, consequently a non-adjustable floor box of simple design has been demanded. A box meeting the requirements is now being placed on the market by W. R. Ostrander & Company, 371 Broadway, New York City. As shown in the accompanying illustration, it is of simple and

New Non-Adjustable Floor Outlet Box.

rugged design which makes it very easy to install in the proper manner. The box body is made of heavy iron finished with baked enamel. The box has an inside steel cap and a heavy brass outside or flange cap, both of which are furnished with rubber gaskets which make the box absolutely waterproof and verminproof.

The ease with which the box can be installed, inspected and repaired appeals to contractors and inspectors. A hole 3⅝ inches is counterbored to a depth of 3/32 inch to receive the cover flange plate, then the hole is continued through the boards at 2⅞ inches diameter. The box is set into the opening with its cap removed. Three No. 6 screws are driven horizontally into the solid wood through the iron body of the box. These screws are easily accessible through the top opening; when driven in place they take all of the strain and weight on the box, thus leaving the face plate merely as a cover.

This floor box proper is 2⅞ inches in diameter and has four outlets, of which two are at the sides and two at the bottom, each fitted with removable plugs. These outlets are drilled and tapped for ½-inch conduit. Only approved separable cap receptacles are furnished with the box, although any good make of receptacle can be fitted with little trouble This box has been approved by Underwriters' Laboratories.

Ideal Face Shield for Welding Operators.

Since electric welding is achieving such gratifying results, an increasing need has been felt for an operator's shield that would be a real protection for the eyes and face and at the same time permit the free movement of the head and arms of the operator.

Several employees of the Pittsburgh, Cincinnati, Chicago & St. Louis Railroad shop at Columbus, O., have developed and perfected such a shield and given it the most thorough and exacting tests, and the results more than justify all the claims made for it. The cut below partially illustrates this shield.

This shield is very light, as it is constructed of aluminum and wood fiber, and by a very clever arrangement is supported entirely on the head of the operator. Another excellent feature is the ease with which the operator can open and close the door containing the colored glasses, thus making it convenient for him to examine his work without removing his shield. When the door is thus opened there is still a glass protecting the eyes from any flying particles.

In addition to these points, the ingenious construction of the shield prevents the possibility of glare or reflection

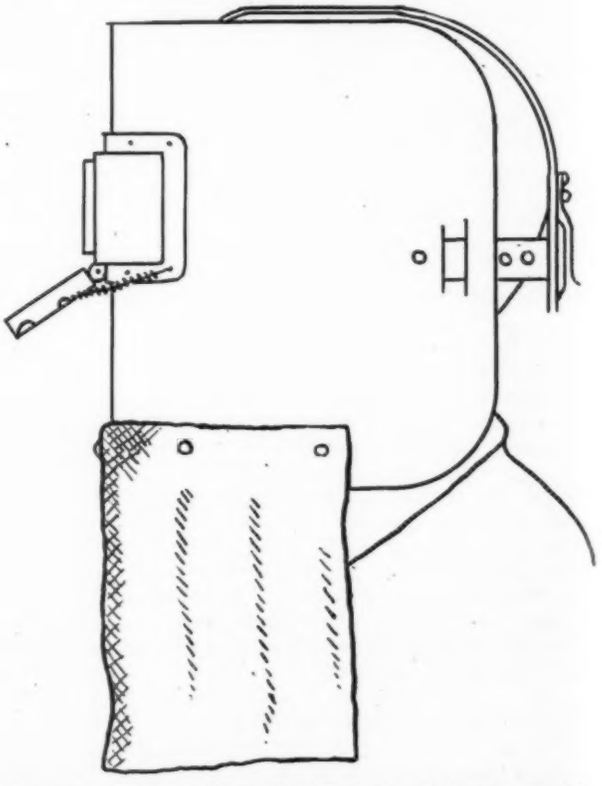


Diagram of Face Shield and Chest Protector for Use by Electric Arc Welders.

from the side or rear, and an apron of fireproof material protects the chest of the operator from his own arc.

Arrangements have been made with the Favorite Manufacturing Company, of Columbus, O., to manufacture these shields. All inquiries should be addressed to E. L. Work, secretary, 468 Garfield Avenue, Columbus, O.

The S. & C. Automatic Switching Units

An Important Development in Switching of High-Tension Circuits Which Offers Promises of Valuable Advantages Over the Oil-Break and Air-Break Switches in Many Cases

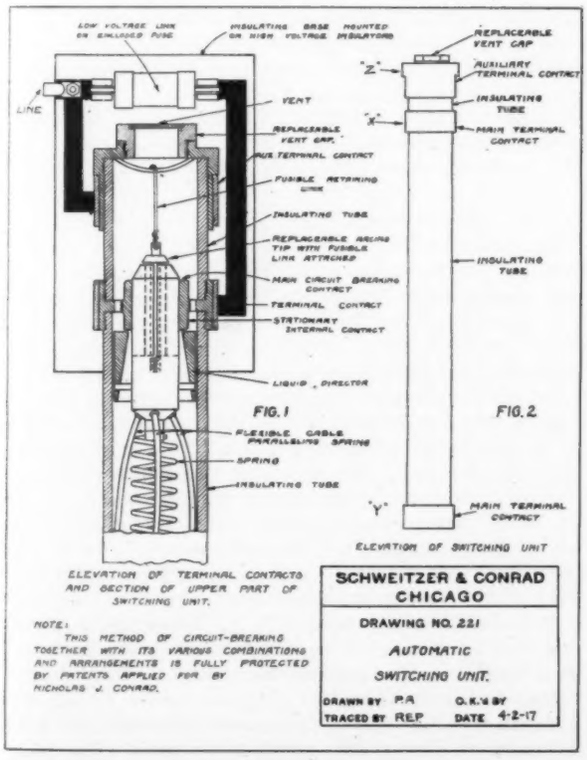
RELIABLE SWITCHING in high-tension circuits is becoming of increasing importance with the rapid increase in extent and capacity of power-transmission networks. While this problem has been solved with fair satisfaction by means of oil-break and air-break switches, these possess limitations and disadvantages that inventive genius has long tried to overcome. It is pleasing to report that as the result of long study and experimentation there has been invented by Nicholas J. Conrad, of Chicago, a new method of switching which promises to overcome the disadvantages of the older methods. Patents on this method of switching and its combinations have been applied for. Arrangements have been made whereby the switching devices employed, known as "S. & C. Automatic Switching Units," will be made by Schweitzer & Conrad, Chicago, Ill.

These switching units provide reliable means for opening high-tension circuits manually whenever desired, automatically on occurrence of heavy overload, short circuit or other violent and dangerous disturbance, or by remote control from any convenient point.

The S. & C. automatic switching unit consists essentially of a high-potential circuit-breaker held in the closed position by means of a fusible noncorrosive link of small current capacity, high resistance and high tensile strength. Fig. 1 shows a partial cross-section of a switching unit and Fig. 2 shows an elevation.

It will be noted that the circuit-breaker proper is inclosed in an insulating tube and is connected between the two main terminals *X* and *Y*, while the fusible link is connected between the movable main circuit-breaking contact and the auxiliary terminal *Z*. The movable contact is actuated by a powerful spring, which in turn is shunted by heavy flexible cables so that the spring carries practically no current. The insulating tube is filled with carbon tetrachloride, a non-inflammable liquid of high dielectric strength, and a liquid director of insulating material is attached to the movable terminal. A replaceable vent is provided at the upper end. The insulating tube is made of special nonfragile Bakelized material. A gauge to indicate the liquid level in the tube can be provided, if desired. The arcing tip on the movable contact, together with the fusible link, the replaceable vents and dielectric liquid, are furnished separately to the consumer so that the switching units can be recharged with little difficulty. It will be evident that this switching unit has all of the good features of the well known and extensively used S. & C. fuse with many additional advantages, some of which are evident from the illustrations herewith. The switching units may also be used with insulating oils, similar to transil oil, and other media.

In Fig. 1 is shown a switching unit in combination with an inclosed fuse, similar to those ordinarily used on low voltages, and connected so that it shunts the fusible link but is in series with the circuit-breaker proper of the switching unit. When the low-voltage fuse opens due to overload, sufficient current will at once be shifted to the fusible link to cause it to melt and this will release the movable main cir-


LOW VOLTAGE LINK OR INCLOSED FUSE
INSULATING BASE MOUNTED ON HIGH VOLTAGE INSULATORS
REPLACEABLE VENT CAP
AUXILIARY TERMINAL CONTACT
INSULATING TUBE
MAIN TERMINAL CONTACT
LINE
VENT
REPLACEABLE VENT CAP
AUX. TERMINAL CONTACT
FUSIBLE RETAINING LINK
INSULATING TUBE
REPLACEABLE ARCING TIP WITH FUSIBLE LINK ATTACHED
MAIN CIRCUIT BREAKING CONTACT
TERMINAL CONTACT
STATIONARY INTERNAL CONTACT
LIQUID DIRECTOR
FIG. 1
FLEXIBLE CABLE PARALLELING SPRING
SPRING
INSULATING TUBE
FIG. 2
ELEVATION OF SWITCHING UNIT
ELEVATION OF TERMINAL CONTACTS AND SECTION OF UPPER PART OF SWITCHING UNIT.
NOTE: THIS METHOD OF CIRCUIT-BREAKING TOGETHER WITH ITS VARIOUS COMBINATIONS AND ARRANGEMENTS IS FULLY PROTECTED BY PATENTS APPLIED FOR BY NICHOLAS J. CONRAD.
SCHWEITZER & CONRAD CHICAGO
DRAWING NO. 221
AUTOMATIC SWITCHING UNIT.
DRAWN BY P.A. O.K.'d BY
TRACED BY REP. DATE 4-2-17

Figs. 1 and 2.—Detailed Section of Upper Portion and General Elevation of Automatic Switching Unit.

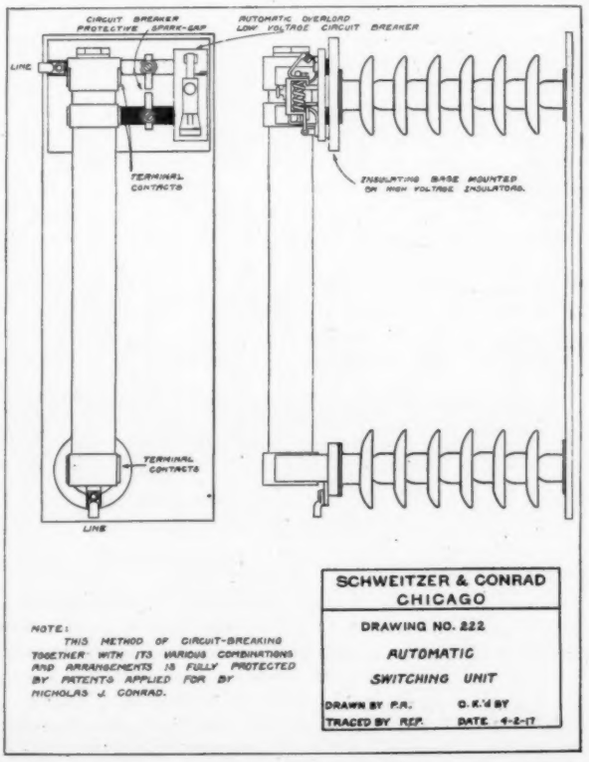

CIRCUIT BREAKER PROTECTIVE SPARK-GAP
AUTOMATIC OVERLOAD LOW VOLTAGE CIRCUIT BREAKER
LINE
TERMINAL CONTACTS
INSULATING BASE MOUNTED ON HIGH VOLTAGE INSULATORS.
TERMINAL CONTACTS
LINE
NOTE: THIS METHOD OF CIRCUIT-BREAKING TOGETHER WITH ITS VARIOUS COMBINATIONS AND ARRANGEMENTS IS FULLY PROTECTED BY PATENTS APPLIED FOR BY NICHOLAS J. CONRAD.
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Fig. 3.—Automatic Switching Unit with Low-Voltage Circuit-Breaker.

cuit-breaking contact. The low-voltage fuse has a twofold function. It makes it possible to keep the principal source of heat outside of the switching unit and, when it operates, it shifts the current to the fusible link. It is not intended to be of any material assistance in the actual rupturing of the high-voltage arc.

With this arrangement the heating of the main fuse has no effect on the liquid or contacts within the switching unit insulating tube. The first explosive effect on short circuit with large connected generating capacity is entirely outside of the switching unit. All of the advantages of accuracy of rating of low-voltage inclosed fuses are available with this arrangement. It is, of course, evident that an open-link fuse could be used instead of the inclosed fuse.

In Fig. 3 is shown a switching unit in combination with a low-voltage overload circuit-breaker. The latter in this case shunts the fusible link and is in series with the circuit-breaking contact of the switching unit. The low-voltage circuit-breaker is shunted by a spark gap to protect it from excessive voltage after it begins to open. With this arrangement there are available all of the advantages of the ordinary low-voltage overload circuit-breakers. With ordinary loads, if the low-voltage breaker is tripped out manually, it will shift the current to the fusible link and cause the switching unit to operate.

In Fig. 4 is shown a three-pole, remote-control arrangement of switching units. In this case a primary overload relay is connected in series with the line before it connects to the upper main terminal. The upper end of the relay plunger is connected mechanically to a switch, which is in series with a dry battery or storage battery connected to the fusible link through the auxiliary terminal, as shown. When the relay operates due to overload, it closes the battery-circuit switch and in that way causes current to flow through the fusible link, which melts and releases the main circuit-breaking contact. The battery is mounted on the high-voltage insulator on the same insulating base with the two terminal clips and the primary relay. The batteries can be equipped with suitable terminals so that they may be replaced by means of an insulated pole without taking the switching unit out of service.

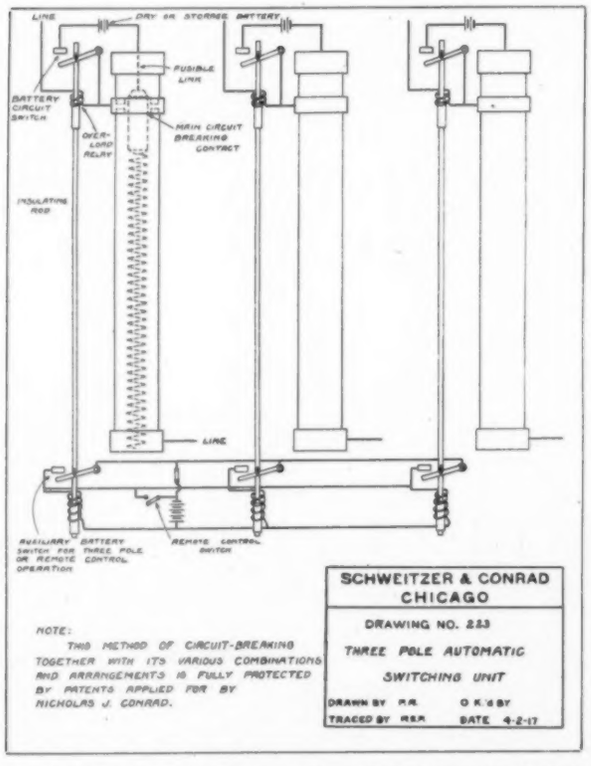


Fig. 4.—Scheme of Operation of Three-Pole Automatic Switching Unit.

The lower end of the primary-relay plunger is connected by means of an insulating rod to an auxiliary battery switch. When the primary relay operates due to overload, it closes the auxiliary battery switch, which in turn causes the operation of the auxiliary relays of the two other poles and closes the fusible link battery circuits of these two poles, causing all three switching units to operate. The operation of the three poles would be practically simultaneous. By means of an ordinary control switch all three poles can, of course, be operated from any remote point.

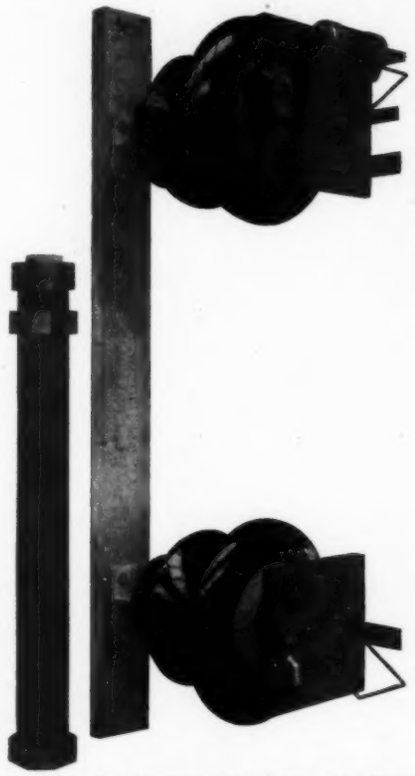


Fig. 5.—66,000-Volt, 500-Ampere Switching Unit, Showing Complete Tube Removed from Mounting.

In some cases, it would be desirable to omit the primary overload relay, and operate all three poles by means of ordinary inverse-time, definite-time, reverse-power, or Merz-Price balanced relays. The S. & C. switching units will open a circuit in much shorter time than the quickest oil circuit-breaker. This feature is of very considerable importance on ring systems of transmission networks where selective action on a number of sections of a ring is very desirable.

In Figs. 5 and 6 are shown actual views of two fuse-controlled switching units of 66,000 and 110,000 volts, respectively. In each case the current-carrying capacity of the unit is 500 amperes, which gives an excellent idea of the wide range of voltages and capacities in which these units can be built, thus making it possible to use them on the very largest as well as all smaller high-tension systems. Although these illustrations show units built for indoor use in generating stations or substations, they are also being developed for outdoor use, the construction in this case including a weatherproof covering.

In all tests the S. & C. automatic switching units have given most excellent results, which give promise of their extensive use on all high-tension systems where reliability of action combined with low cost is desirable. In all respects

they are at least the equal of the oil circuit-breaker and in most respects superior to it. They are much more compact and simpler in construction. They are very much lower in first cost and in maintenance cost. They are comparatively free from auxiliaries and require no current transformers at

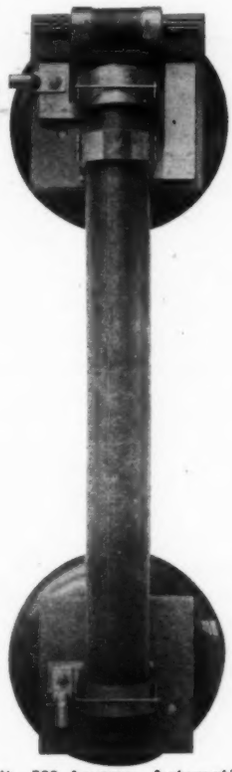


Fig. 6.—110,000-Volt, 500-Ampere Automatic Switching Unit Complete.

all, since the primary current controls them directly. They are therefore more reliable and much quicker in breaking even the heaviest currents, thus minimizing the disturbance due to short circuits, heavy surges or other abnormal conditions.

Arrangements have been completed to secure extensive service data on these units in various classes of high-tension power service. As soon as available these data will be published in these pages.

Acid-Resisting Alloys of Chromium, Copper and Nickel.

The growing interest in special acid-resisting alloys and the many uses found for them have stimulated both the search for efficient materials of this nature and the study of the causes underlying their inertness. As a result of previous studies at the University of Illinois it has been shown that the almost perfect insolubility of certain alloys in nitric and other acids seems to be conditioned upon a proper mixture of chromium, copper, and nickel, together with smaller quantities of such added metals as tungsten or molybdenum.

The University of Illinois Engineering Experiment Station has just completed a preliminary systematic study of the alloys of chromium, copper and nickel, and their properties. The work has been under the direction of D. F. McFarland, assistant professor of applied chemistry, and O. E. Harder, fellow in chemistry.

As a result of the studies mentioned, methods have been developed for making castings of alloys of chromium, copper, and nickel; and 21 binary and 30 ternary alloys have been prepared. Physical and chemical tests have been made to determine the properties of the various alloys.

More than 300 corrosion tests have been made to measure the effects of acids upon the metals. In general the results indicate that certain of the alloys of chromium, copper and nickel give promise of becoming of great commercial importance not only in the construction of laboratory apparatus, but in manufacturing and chemical processes in which the handling of acids is involved.

Copies of Bulletin No. 93, containing the results of these tests, may be obtained without charge by writing C. R. Richards, Director of the Engineering Experiment Station, Urbana, Ill.

Dead-Front Panel Units with Push-Button Switches.

For several years the Bryant Electric Company, Bridgeport, Conn., has manufactured a line of dead-front,distributing panels with rotary switches. These devices have met with the universal approval of contractors and users for installation in apartment houses, hotels, residences, offices, etc. To meet the desire where push-button switches are preferred, the company now offers the dead-front distributing panel with push-button switches.

In general the construction of this line consists of a substantial porcelain base properly recessed to accommodate the standard two-button switch mechanism, of which two are provided for each unit. Provision is also made for fuse plugs for each line to the switch.

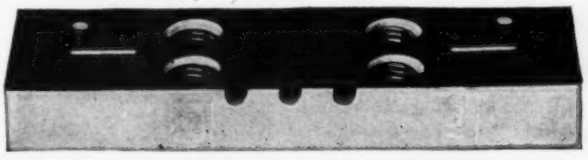
The feature of dead-front construction is that all connections and conductors are concealed and separated from the front of the panel by a continuous sheet of insulating material; hence there can be no live parts exposed. Moreover, the sheet-metal front of each unit has an overhanging edge which engages with the front of the adjoining unit, thereby effectively preventing accidental contact with any live parts.

In case the switch mechanism requires adjustment the cover of the particular unit can be readily removed, and the mechanism lifted from its socket. The switch mechanism can be replaced or a new one substituted just as readily and quickly.

Because the "on" and "off" buttons are respectively white and black, the conditions of each switch may be readily distinguished. The fuses are self-indicating and can be replaced by anyone without the slightest danger of contact with the circuit, and without the use of screwdrivers or other tools and the attendent danger of using them.

These dead-front panels with push-button switches can be furnished in the following types: double-pole, single-branch; double-pole, double-branch; triple to double-pole, double-branch

The advantages of these units to user and dealer are numerous. Control of branch-line service is secured by a neat and compact but simple device. The contractor with a quantity of these switches in stock is ready to make up



Dead-Front Panel Unit with Switches.

lighting panels of any size, thus avoiding delays and expensive stock. The parts are so readily assembled that installation costs are greatly minimized and the resulting assembly is remarkably inexpensive.

These units may be installed in any standard steel or wood cabinet having a minimum depth of three inches. Panels are regularly supplied with dull-black covers, but white-enameled covers can be had without extra charge.

Activities in the Trade

Pass & Seymour, Incorporated, Solvay, N. Y., has issued catalog sheets on its porcelain angle caps and sockets.

Robbins & Myers Company, Springfield, O., has moved its Chicago office from the Monadnock Block to 1444-8 Conway Building.

National Conduit & Cable Company, New York, N. Y., has changed the location of its Chicago office from 72 West Adams Street to the Rookery Building.

Diamond Power Specialty Company, Detroit, Mich., has issued bulletin No. 125, on the application of its soot blowers to the boilers of the Babcock & Wilcox Company.

Queen-Gray Company, 616 Chestnut street, Philadelphia, Pa., has issued bulletin No. E-6, descriptive of its portable testing sets and instruments for the maintenance of cables.

Franklin Electric Manufacturing Company, Middletown, Conn., has awarded a contract for the construction of a four-story factory building, 40 by 200 feet, to adjoin the company's plant.

Burke Electric Company, Erie, Pa., has opened a Washington branch sales office in charge of J. N. Perry at 424 Union Trust Building, exclusively for United States Government service during the war.

Atlantic Insulated Wire & Cable Company, New York, N. Y., announces the removal of its general sales office from 120 Liberty Street to the Vanderbilt Concourse, 52 Vanderbilt Avenue, New York City.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is distributing a large mailing piece entitled "What Motor Car Distributors Are Doing," descriptive of the C-H magnetic gear shift for automobiles.

Radium Luminous Materials Corporation, 123 North Third Street, Newark, N. J., manufacturer of radium light specialties, has acquired property now being occupied on Alden Street, Orange, for manufacturing.

The Imperial Porcelain Company, Trenton, N. J., manufacturer of electrical porcelain products, is planning the erection of a new plant near Asbury Park, to cost about $25,000. Frederic A. Duggan is head of the company.

Westinghouse Church Kerr & Company, New York, N. Y., are distributing a bulletin entitled, "Only a Week's Interruption by Fire," in which the ability of this organization to meet unexpected demands upon its construction forces is illustrated.

The Safety-Armorite Conduit Company has removed its New York office to 511 West Twenty-seventh Street, New York City, where it will be in connection with the company's new warehouse. William G. Campbell is manager of the New York office and associated with him are Victor F. Gates, William F. Dimelow and George Pittengill.

Benjamin Electric Manufacturing Company, Chicago, Ill., has announced that its sales and publicity department will be moved to new and spacious quarters in the administration suite in the building at 130-132 South Sangamon Street, next door to the company's factory. The change was made necessary because of the growth of the department, and the new arrangement assures even more efficient service for the trade in the future.

Crocker-Wheeler Company, Ampere, N. J., has issued bulletin 173, on slot-bridge construction for induction motors; bulletin 174, on its Form L, direct-current, 115, 230 and 550-volt, 0.2 to 7.5-horsepower motors and 0.4 to 5-kilowatt generators; bulletin 175, on its Form I, direct-current, 3.75 to 50-horsepower motors and 3 to 45-kilowatt generators; and bulletin 176, on its Form R, two and three-phase, 25-cycle, squirrel-cage induction motors.

New Jersey Products Company, West Orange, N. J., has been incorporated with a capital stock of $500,000 by Thomas A. Edison, Charles Edison and R. H. Allen, West Orange, N. J.; Stephen B Mambert, East Orange, and A. C. Emery, Montclair. The company will manufacture chemicals, glues, veneers, stains and shellac, paper products, phonographs, sound records, storage batteries, etc.

Rathbone Sard Electric Company, North Ferry Street, Albany, N. Y., is planning for immediate operations in its new plant, recently completed, to be devoted to the manufacture of electric ranges and cooking devices. The plant will employ about 150 hands and have a yearly capacity of 50,000 ranges. The company is affiliated with Rathbone Sard & Company, manufacturers of stoves and gas ranges. H. P. G. Nostrand is vice-president and general manager.

General Electric Company, Harrison, N. J., has taken bids for the erection of a new four-story and basement plant, 108 by 512 feet, on Lillie Avenue, near Seventeenth Street. The company is also building a large plant at Seventh and Willow Streets, Philadelphia. The building is six stories in height, about 175 by 270 feet, providing a floor area of about 125,000 square feet. The new structure will be used as a branch manufacturing works, employing for initial operations about 1200 people.

Davis Slate & Manufacturing Company, Chicago, Ill., which claims to have the largest exclusive electrical slate business in the world, is enlarging its facilities to handle its constantly increasing business. The new price list which the company recently issued, giving the price per slab of slate, is pronounced by users of slate to be the most convenient price list ever published and the company has been highly complimented for its efforts to benefit the slate buyer. Any manufacturer, jobber, dealer or user of slate who has not received this latest price list can obtain a copy by writing to the Davis company.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued the following among its recent publications: Leaflet No. 3890, on portable fault localizers, describes these instruments designed for locating grounds in feeder circuits, same being an application of the Wheatstone bridge mounted in a portable case. Overhead relays, type HB, are described in leaflet No. 3978; these relays are designed for indoor use on high-voltage circuits, offering ample protection and sufficiently accurate time element for ordinary service. Leaflet No. 3977 deals with electrical speed indicators for use in power stations, industrial plants and similar applications; these sets consist of a magneto generator and direct-current voltmeter, the voltage of the magneto being proportional to the speed so that the indications of the meter read speed directly. Leaflet No. 3976 is devoted to outdoor metering equipments adapted for use on transmission lines where the expense of a substation is not warranted. Potentiometers for the measurement of "hot spots" in the electrical apparatus are described in leaflet No. 3324; this instrument is said to be the most accurate and reliable device for measuring the temperature in parts of machines that are inaccessible to thermometers; the principle involved is that of the thermo-electric couple with the voltage determined by a potentiometer.

Personal and Biographical

W. L. WESTON, for several years local manager of the Paducah (Ky.) Light & Power Company and the Paducah Traction Company, has been transferred to management of the Stone & Webster properties at Houghton, Mich., and is succeeded at Paducah by A. S. NICHOLS, formerly of Ft. Madison, Iowa.

ALBERT S. DEVEAU, president of the DeVeau Telephone Manufacturing Company, which was consolidated with Stanley & Patterson, Incorporated, a short time ago, has been elected secretary and a director of the latter concern, and is in charge of its factory

A. S. De Veau.

sales. Mr. DeVeau has been actively engaged in the electrical business for over 30 years and during that period has been very instrumental in developing the automatic intertalk telephone industry. He was president of the DeVeau Telephone Manufacturing Company for 25 years and previous to the organization of that company was associated with the Westchester Telephone Company, J. H. Bunnell & Company, Western Electric Company and the Frederick Pearce Company. During his many years in the electrical field Mr. DeVeau has formed a circle of friends that extends throughout the country. He is a member of the Jovian Order, being treasurer of the Jovian League of New York City, a member of the Hardware Club and many other social and fraternal organizations.

A. B. PATERSON has resigned the general managership of the Meridian (Miss.) Light & Railway Company, operated by Henry L. Doherty & Company, to take up the duties of bond department representative of Henry L. Doherty & Company, in New Orleans and contiguous territory with headquarters in that city. H. E. BRANDLI, formerly general manager of the Citizens Gas, Electric & Heating Company, Mt. Vernon, Ill., recently sold by the Doherty organization to the Frye interests, succeeds Mr. Paterson as general manager of the Meridian company.

CHESTER BROGAN, of London, Ky., has been appointed manager of the lighting plant at Jenkins, Ky.

CHARLES S. HERVEY has been reappointed to serve another term on the Public Service Commission of the First District of New York.

EDWARD FLAD, consulting engineer, St. Louis, has been appointed to succeed JOHN KENNISH on the Public Service Commission of Missouri.

WILLIAM L. O'CONNELL has retired as chairman of the Illinois State Public Utilities Commission, having served in this capacity for the past three years.

LOUIS A. FERGUSON, vice-president of the Commonwealth Edison Company, Chicago, Ill., recently was elected vice-president of the Commercial Club of Chicago.

NOAH W. SIMPSON, secretary to the Governor of Missouri, has been made successor to HOWARD B. SHAW on the Public Service Commission of that state.

JOHN SHORTT has resigned as chief wiring inspector, Saanich, B. C., to become manager of the Cumberland Electric Lighting, Heat & Power Company, Cumberland, B. C.

ARNOLD SWAIN has been appointed assistant treasurer of the Key West (Fla.) Electric Company, to succeed R. C. SHEPARD, who was transferred to the office of the treasurer of the Stone & Webster Management Association, Boston, Mass.

WILLIAM H. HOWARD, division publicity manager of the Bell Telephone Company, Harrisburg, Pa., has resigned, to engage in business at Bethlehem. He will be succeeded by J. B. TAFT, associated with the company's publicity department at Philadelphia.

SAMUEL INSULL, president of Commonwealth Edison Company, Chicago, Ill., has been appointed chairman of the Illinois Council for Defense, recently organized, and will assist in directing the plans for the assembling of the industrial resources of the state for national defense.

H. A. HOWARD, formerly connected with the Diehl Manufacturing Company, has been appointed manager of the New England office of the C. & C. Electric & Manufacturing Company. Before his connection with the Diehl company Mr. Howard was associated for many years with the C. & C. Electric Company.

ROY B. WOOLLEY, sales manager of the Standard Electric Stove Company, Toledo, O., has enlisted in the American Field Ambulance Corps for duty in France. He will take charge of an ambulance provided by Willis P. Tanner, of New York City, and sailed for France about two weeks ago. On hearing of his action the management of the Standard Electric Stove Company assured him of its warm support and will hold his position open for him until his return.

JAMES J. BURNS, for a number of years engaged in newspaper work in Reading, Pa., has been appointed to the position of manager of public information by the Reading Transit & Light Company. Mr. Burns will head a department devoted to publicity work regarding the operation of the company's street-railway and electric-lighting systems.

ARTHUR E. LUBECK, sales representative of the Benjamin Electric Manufacturing Company, Chicago, Ill., for the past five years, has been appointed manager of the Detroit office which the company has just opened. Mr. Lubeck

A. E. Lubeck.

has a wide acquaintance in the Middle West and his many friends will rejoice at his well earned promotion. In his new capacity he will have charge of sales in the states of Michigan, Minnesota and Wisconsin.

FRANK M. HAWKINS, one of the pioneers in the switchboard and panelboard business, has resigned as southeastern sales agent of the Crouse-Hinds Company of Syracuse, N. Y., with offices at 30 Church Street, New York City. Mr. Hawkins began his electrical career in 1883 and during his early work was connected with the Electrical Engineeer & Supply Company, the forerunner of Crouse-Hinds Company, and assisted in the construction and installation of many electrical plants in this country, it being his duty to secure the franchises, erect the pole lines, wire the buildings, set the dynamos and engines, turn on the lamps and receive the plaudits of the villagers. In 1889 Mr. Hawkins became a salesman for the same company, traveling throughout the United States and Canada, and in 1893 went to New York City, being placed in charge of the sales office there and continuing in that capacity when the company was taken over by the Crouse-Hinds Company. During his 35 years' connection with the industry, Mr. Hawkins has made an exceptionally long list of friends in the electrical fraternity.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

DANBURY, CONN.—The state legislature has granted the Danbury & Bethel Gas & Electric Company permission to increase its capital stock to $1,000,000.

NEW HAVEN, CONN.—Residents on Grand Avenue are contemplating the installation of a white-way system in that avenue, between State Street and Railroad Avenue.

BUFFALO, N. Y.—Commissioner Kreinheder is conducting negotiation with local utility companies for the placing of wires underground in Virginia Street.

FAR ROCKAWAY, N. Y.—On April 30 Rockaway Beach borough officials inaugurated a new street-lighting system along the beach, extending for a distance of about five miles, units being spaced at intervals of 20 feet.

HORNELL, N. Y.—As soon as a bond issue of $25,000 can be issued the new lighting system of Hornell will be started, according to an announcement made by the Hornell Electric Company. The company will pay for the laying of the wires underground and the city will pay for the standards for the curb lights. The system throughout the city will be altered and the arc lamps will be discarded.

NEW YORK, N. Y.—One of the longest submarine cables for telephone service will be installed by the New York Telephone Company from Annadale, Staten Island, to Keansburg, N. J., a distance of five and three-quarters miles under Raritan Bay. The new line will be used by the New Jersey coast resorts, including Asbury Park, Long Branch and Sea Bright, for direct trunk connection to New York. A special car float has been constructed to provide for the installation of the new line.

WOODRIDGE, N. Y.—The Murray Electric Light & Power Company, of Monticello, contemplates the construction of an electric light and power plant in this village.

DOVER, N. J.—The Board of Aldermen has made an appropriation of $7,750 for street lighting during the present year.

DOVER, N. J.—The New Jersey Power & Light Company has commenced the construction of a new line from Landing to Netcong and Stanhope, to furnish local light and power service. The company has recently installed three 500-kilowatt, 33,000-volt transformers at its local power station, to carry the entire load of the system, and heretofore supplied in part from the plant at Boonton. E. E. Yensel is general manager.

GLASSBORO, N. J.—The Bell Telephone Company will install an underground conduit system in High Street to eliminate present overhead lines.

NEWARK, N. J.—The Public Service Electric Company has awarded a contract to Connery & Company, Newark, for the installation of new air ducts at its Essex Power Station at a cost of $13,500.

NEWARK, N. J.—Fire April 28 in the boiler room and power plant of the Hewitt Steel Corporation, Chapel Street and Lister Avenue, caused a loss of about $10,000, destroying three generators, four boilers, two air compressors and other equipment.

NEWARK, N. J.—The Public Service Corporation, operating the Public Service Electric Company, the Public Service Railway Company and the Public Service Gas Company, has filed notice at Trenton of increase in its capital from $30,000,000 to $50,000,000 for expansion.

NEWARK, N. J.—The Board of Works has authorized the purchase of a site at Avenue A and Vanderpool Street for the proposed municipal garbage disposal plant. The plant, with capacity of about 300 tons daily, is estimated to cost $400,000, and will be constructed to provide for the later addition of a municipal electric station. Morris R. Sherrerd is chief engineer.

PATERSON, N. J.—The Board of Public Works has authorized the Mayor to enter into contract with the Public Service Electric Company for extension of the street-lighting system on Main Street.

WESTFIELD, N. J.—The Borough Council has awarded a five-year street-lighting contract to the Public Service Electric Company.

WILDWOOD, N. J.—The Board of Trade is planning the installation of a new flood-lighting system on the beach to permit night bathing. Extensions will be made in the lighting system along the boardwalk.

ALBION, PA.—The United Lighting Company has been granted permission by the Public Service Commission to issue bonds for $110,000 for extensions, etc.

ALLOWAY, PA.—Citizens here have voted to install an electrical distribution system. Service will be furnished from the plant at Salem.

GREENVILLE, PA.—The Public Service Commission has granted the Mercer County Light, Heat & Power Company permission to issue bonds for $300,000 for expansion.

HAMBURG, PA.—Daniel J. Driscoll is installing new electric furnace equipment at the former plant of the Multiple Parts Company, to be remodeled for a steel mill.

JOHNSTOWN, PA.—The Citizens Light, Heat & Power Company will install new street lights in the business district, using the recently completed underground conduit system. P. J. Morrisey is general superintendent.

KINGSTON, PA.—The Luzerne County Gas & Electric Company has been granted permission by the Public Service Commission to issue bonds for $270,000 for expansion.

LEMOYNE, PA.—The United Electric Company is installing new equipment at its local station to increase the capacity. The new installation will comprise a turbogenerator, rotary converter and transformers, with auxiliary apparatus.

PHILADELPHIA, PA.—The Philadelphia Electric Company has awarded a contract to John R. Wiggins & Company, Otis Building, for the erection of a new one-story, reinforced-concrete substation, 134 by 145 feet, exclusive of electric work and equipment.

SCRANTON, PA.—The Public Service Commission has granted the Scranton Electric Company permission to issue bonds for $183,000 for extensions.

SCRANTON, PA.—Electric equipment will be installed by the Scranton Textile Company, Penn Avenue and Poplar Street, for plant operation, changing from steam power to electric-driven machinery. William E. Bright is in charge.

BALTIMORE, MD.—J. H. and L. A. Dockman, 32 East Montgomery Street, will build a new power station in connection with an ice plant at Rock Creek, Anne Arundel County.

CHARLESTON, W. VA.—The Charleston-Gauley Electric Railroad Company has been organized to build a traction line from Charleston to Gauley Bridge. The authorized capital is $100,000, and the incorporators are G. P. Alderson, J. Y. Arter and others, of Charleston.

HARTLAND, W. VA.—The Hartland Power Company is building a new power plant with capacity of about 1,000 kilowatts. The installation will consist of three 250-horsepower watertube boilers, with auxiliary apparatus, and a 1,000-kilowatt electric generator. Transmission lines will be constructed to reach the neighboring mining sections, and a series of substations established for furnishing power at voltage for operation. W. S. Barstow & Company, 50 Pine Street, New York, operates this company.

TRENTON, N. C.—The Brock Electric Company has been organized by Fernifold Brock and others, with a capitalization of $25,000, to furnish electric service in this vicinity.

JEFFERSON, S. C.—The Legislature has granted authority for the issuance of $15,000 of municipal electric light plant and waterworks bonds.

ATLANTA, GA.—Announcement was made at an organization meeting of the Atlanta-Anderson Electric Railroad Company that the entire capital stock has been subscribed and that practically all of the right of way has been secured for an electric railway between Atlanta and Anderson, S. C. J. L. Murphy was elected president.

NORTH CENTRAL STATES.

CANTON, O.—The City Council has authorized the installation of a lighting system on Woodland Avenue and will let contracts shortly.

CINCINNATI, O.—Fire on May 4 destroyed the electric plant of the Coney Island Company, near Cincinnati, with a loss of $50,000 to the electric and other equipment in the building. For the present the company will use energy from the lines of the Union Gas & Electric Company, and will decide later on whether to rebuild the power station.

CINCINNATI, O.—The City Council has decided upon the legislation necessary to authorize the construction of a boulevard lighting system in the business district, and it is believed that the entire system can be completed by fall. The system will cover approximately seven miles in the downtown district. Estimates have also been prepared for the installation of an ornamental lighting system on McMillan Avenue and on Gilbert Avenue, not included within the downtown system, the McMillan avenue system being estimated to cost $14,300 a year and the Gilbert Avenue system $5,850 a year.

EAST PALESTINE, O.—The Youngstown & Sharon Street Railway Company will extend its power lines to this city at once, having recently executed a ten-year contract with the East Palestine Rubber Company for power.

HAMILTON, O.—The Hamilton Electric Company has closed a contract with the Peters Cartridge Company, King's Mills, O., for the installation of electrical equipment throughout the plant. The contract amounts to $25,000.

MECHANICSBURG, O.—The Northwestern Ohio Light & Power Company has purchased property in Mechanicsburg on which the company plans the erection of a substation.

NELSONVILLE, O.—An ornamental lighting system will be installed in the business district, at a cost of $600, to be paid by property owners and business men, and to be maintained by the city.

WEST MANSFIELD, O.—On June 5 voters here will consider a proposition of selling the municipal electric lighting plant.

SOUTH BEND, IND.—With the idea of completing the boulevard system of South Bend as soon as possible the Board of Works has ordered 13 60-candlepower boulevard lamps placed on Corby Street.

SULLIVAN, IND.—The County Commissioners have granted a franchise to the Terre Haute, Indianapolis & Eastern Traction Company to extend its power lines to the mines of the Vandalia Coal Company.

ELGIN, ILL.—B. S. Pearsall has purchased the old Waverly mill in this city.

and plans the installation of a modern hydroelectric plant.

EMINGTON, ILL.—The Town Board is planning ways and means to install an electric lighting system.

PARIS, ILL.—The Board of Local Improvements is advocating an improved electric lighting system in the business district.

HOLLY, MICH.—The village has granted a franchise to the Consumers Power Company for furnishing electric service here. Recently bonds were voted for the municipal power plant, but the plan was abandoned.

HOWELL, MICH.—The Common Council has voted to install boulevard lights on all paved streets in this city, bids for installation of which will be asked at once.

NEENAH, WIS.—A subscription list is being circulated among residents of this city and Menasha to secure funds for an ornamental lighting system on Nicolet Avenue, the dividing line between the two cities.

PRINCETON, MINN.—The St. Cloud Power Company has entered into negotiations with the city for the purchase of the local electric plant, and plans to furnish service from its system.

SUNRISE, MINN.—The Sunrise Milling Company will erect an electric power plant. J. C. Jacobson, 743 Security Building, Minneapolis, Minn., has prepared the plans.

BURLINGTON, IOWA.—The Peoples Gas & Electric Company will build several transmission lines this year. One line will connect Burlington with Mediapolis, Morning Sun, Wapello and Winfield. Power from the Keokuk dam then will be supplied to the cities north of Burlington. Another transmission line will be built from Burlington to Middletown.

SIOUX CITY, IOWA.—It is reported that improvements, involving the erection of a new power plant and several substations are contemplated by the Sioux City Service Company. It is estimated that $750,000 will be spent for the construction.

JOPLIN, MO.—Whether the city shall issue $200,000 in bonds to build a new municipal light plant or go out of the power business and enter into a contract with the Empire District Electric Company for its supply of energy for the street lights are two questions that will be submitted to vote at an election soon.

SPRINGFIELD, MO.—Reports have been received here from St. Louis that the Federal Light & Traction Company, owner of the local traction system, has opened negotiations for the purchase of the Frisco Railway power plant here.

ARCADIA, KANS.—The City Council is planning an extension of a line from Pittsburg to supply this town with electricity.

LONG ISLAND, KANS.—An election will be held May 22 to vote on the issuance of $8,000 in bonds to install an electric light plant.

MARYVILLE, KANS.—An extension of the local electric distribution system is planned.

MEDICINE LODGE, KANS.—Harry Dobson and J. N. Tincher have presented a proposition to the town of Sharon offering to run an electric line to that town from the plant here and supply electric service.

GUIDE ROCK, NEB.—Plans are being considered by R. Brogg for extending the local electric distribution system.

OMAHA, NEB.—The City Council has ordered the installation of 342 electric lighting units in the business district, and they are now being installed by the Omaha Electric Light & Power Company.

UPLAND, NEB.—Bonds in the sum of $8,500 have been voted for the installation of an electric light and power plant.

BELLE FOURCHE, S. D.—The North Star Electric Railway Company has been organized to build an electric railroad from Belle Fourche to Dickinson via Scranton. The construction of an electric power plant is contemplated in connection with the project, in which F. E. Duba is interested.

GETTYSBURG, S. D.—The City Council has passed on its first reading the ordinance granting an electric light and power franchise to Hugh Triplett, of Aberdeen, who proposes building an electric plant here.

LESTERVILLE, S. D.—A bond issue of $8,000 for a municipal lighting system carried at a recent election.

COURTENAY, N. D.—A bond issue of $7,000 for the establishment of an electric lighting plant was approved at a recent election.

WASHBURN, N. D.—E. D. Jackson, engineer, St. Paul, Minn., has made a survey preliminary to preparing plans for the erection of a power plant at Bitumina, six miles east of here. A company has been capitalized at $150,000 to finance the project, which includes the supply of power to Washburn, Turtle Lake, Denloff, Goodrich and other towns in this territory.

DATES AHEAD

Arkansas Association of Public Utility Operators. Annual convention, Pine Bluff, May 16-18. Secretary-treasurer, R. B. Fowles, Pine Bluff Company, Pine Bluff, Ark.

Missouri Association of Public Utilities. Annual meeting, aboard Steamer Quincy en route from St. Louis, May 17-19. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Electrical Supply Jobbers' Association. Semi-annual meeting, Homestead Hotel, Hot Springs, Va., May 23-24. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Iowa Section, National Electric Light Association. Annual convention, Des Moines, Iowa, May 24-25. Secretary, L. E. Caldwell, Iowa City, Iowa.

Electric Power Club. Spring meeting, Homestead Hotel, Hot Springs, Va., June 11-14. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Electrical Contractors' Association of Pennsylvania. Annual convention, Philadelphia, Pa., June 19-21. Secretary, M. J. Sellers, 1518 Sansom Street, Philadelphia, Pa.

American Institute of Chemical Engineers. Semi-annual meeting, Buffalo, N. Y., June 20-22. Secretary, J. C. Olsen, Cooper Union, New York City.

American Institute of Electrical Engineers. Annual meeting, Hot Springs, Va., June 26-29. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association, Annual convention, Breakers Hotel, Cedar Point, O., July 16-20. Secretary, D. L. Gaskill, Greenville, O.

SOUTH CENTRAL STATES.

ADAIRVILLE, KY.—R. B. Brian, J. E. and R. W. Russell have incorporated the Adairville Lighting Company with a capital stock of $12,000.

LANCASTER, KY.—Bastian Brothers, who have the franchise for operation of an electric lighting plant here, have purchased the plant of Alex Walker in this city. The purchasers will improve the plant and it is stated that they will provide 24-hour service.

RICHMOND, KY.—The Richmond Water & Light Company has let a contract to W. W. Broaddus & Company for improvements at the reservoir of the company, estimated to involve $20,000.

SOMERSET, KY.—The Southern Machinery Exchange, Somerset, is asking for dealers' prices on a 300-kilowatt, 2,300-volt, three-phase, 60-cycle generator and a 200-horsepower, three-phase, 60-cycle transformer.

WHITESBURG, KY.—The City Council has advertised an electric lighting franchise to be sold this week. Representatives of the Kentucky River Power Company have been investigating the situation.

ARLINGTON, TENN.—The city has sold $15,000 of bonds with which a municipal water and light plant will be established. A deep well is being dug and a light and power plant will be established, to be operated by oil engines.

McMINNVILLE, TENN.—The Great Falls Power Company is completing the construction of its power plant at Caney Fork Falls. This project included connecting the Collins River with the Caney Fork River by means of a concrete tunnel, 640 feet long, to provide a fall.

OZARK, ARK.—The Ozark Light Plant, A. Littleton, manager, is planning to overhaul the light and power system here.

BRISTOW, OKLA.—The holdings of the Bristow Ice & Light Company have been sold to J. J. and D. O. Darnell, Cripple Creek, Colo., who will make improvements.

COLLINSVILLE, OKLA.—The municipal electric plant will be improved by the installation of new machinery, which will cost about $14,000.

FREDERICK, OKLA.—The city has completed the purchase of the electric light plant of the Foster-Harris Gin & Electric Company at a valuation of $35,625, and has taken charge of the plant, which will be run in connection with the city waterworks system. Service extensions are contemplated.

MARIETTA, OKLA.—The City Council has adopted a resolution to extend the local white-way system.

OKLAHOMA CITY, OKLA.—Plans are on foot for the extension of the white-way system to Broadway Circle.

POND CREEK, OKLA.—Arrangements are being made to construct an electric line to Enid, Okla., to transmit power to this place.

AUSTIN, TEX.—Plans are being discussed for placing the light and power wires underground in the downtown district.

ODESSA, TEX.—The Odessa Light & Power Company has been chartered with $4,000 capital stock by R. N. Henderson, W. F. Bates and W. H. Rhodes.

PORT ARTHUR, TEX.—Plans are being made for a white-way system here.

WESTERN STATES.

PEACH SPRINGS, ARIZ.—Preliminary plans for using electricity and power on the Santa Fe Railroad are under consideration, according to E. P. Ripley, president of the company. J. B. Girand, of the W. L. Park Construction Company, of New York, has prepared plans for a hydroelectric plant on the Colorado River, 21 miles north of the city, which would furnish power not only to the railroad company, but for the operation of mines in central and northern Arizona.

PHOENIX, ARIZ.—Citizens of the Higley district have formed Electric District No. 2 of Maricopa County, for the purpose of getting electric service.

ST. JOHNS, ARIZ.—The Board of Supervisors has granted an electric light and power franchise within Apache County to Gustav Becker. He will serve Springerville, Eager and Round Valley.

BINGHAM, UTAH.—The Utah Light & Power Company is contemplating the installation of an ornamental lighting system in Main Street.

SALT LAKE CITY, UTAH.—The County Commissioners have set May 14 as the time for opening bids on lighting county thoroughfares. The Utah Power & Light Company, the Progress Light & Power Company and the Murray City Light & Power Company have been asked to submit bids.

SALT LAKE CITY, UTAH.—One new power plant is to be built, two plants which have been out of commission for more than three years put in operation, and a new transmission line will be strung by the Southern Utah Power Company and the Beaver River Power Company, which are controlled by L. L. Nunn. More than $500,000 will be expended in the new work to be done by the power companies. The new plant of the Beaver River Company will be located directly below the present plant which the company has on the Beaver River. The Northern Utah Power Company will build a high-tension line from Richmond to Fillmore, and a number of short transmission lines are to be built at other sections of Sevier, Beaver and Piute Counties, to provide power for mining companies which now use steam for operation.

LOVELOCK, NEV.—The Nevada Valley Power Company will build a new power plant and 73 miles of power line on the Truckee River near Vista. The new improvements will cost a quarter of a million dollars, according to an official announcement from the company's office.

SEATTLE, WASH.—A $35,000 power house is included in the plans for the equipment of the new Sedre-Wooley Hospital at the Veterans' Home at Retsil.

SEATTLE, WASH.—The Sound Paper Company, recently incorporated at Olym-

pia with a capital stock of $5,000,000, will establish a power plant on the Sultan River in connection with its paper mill.

HALFWAY, ORE.—The Idaho Light & Power Company has secured a franchise to serve the city of Cornucopia with electric power and has been awarded a ten-year contract to serve the city with electricity. A power line will be constructed at once from Robinette to Cornucopia.

KLAMATH FALLS, ORE.—The City Council has granted a 25-year electric light and power franchise to the Keno Power Company.

EAGLE ROCK, CAL.—Plans are under way for the immediate installation of an ornamental street-lighting system here.

ESCONDIDO, CAL.—The San Diego Consolidated Gas & Electric Company is rebuilding its distribution system here.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has applied to the State Railroad Commission for permission to construct a transmission line from Oceanside to San Juan Capistrano to furnish electric service in the latter place.

SAN FRANCISCO, CAL.—The Yosemite Power Company has been refused permission to use the Poopenaut reservoir and other works and right of way in Yosemite National Park.

WATTS, CAL.—The Board of Trustees has adopted an ordinance calling for the improvement of Elm Street from Shorb Avenue to Ruoff Street by the installation of an ornamental lighting system.

PROPOSALS

ELECTRICAL WORK.—Bids will be received May 30 at the office of James M. White, Supervising Architect, Urbana, Ill., for the general contract, heating, plumbing and electrical work on two university buildings estimated to cost $400,000.

TURBOGENERATORS.—Bids endorsed "Proposals for Turbogenerators for Various Yards" will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 21, for furnishing and installing 500 and 750-kilowatt turbogenerators and 2500, 3125, 3750 and 4375 kilowatt-ampere turboalternators for the various navy yards. Specifications are on file at the Bureau. F. R. Harris, Chief.

ELECTRIC HEATING EQUIPMENT.—The Board of Commissioners of Lake County will receive sealed bids May 16 at the auditor's office in Crown Point, Ind., for electric equipment to be installed in the Lake County jail as follows: One 30 one-pound-loaf electric bake oven; one six-burner electric range with 18 by 18 by 12-inch oven below, known as the box range type; one one-half-barrel dough mixer, equipped with electric motor; one washing machine equipped with wringer and electric motor. Edward Simon, County Auditor.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 1064, Philadelphia, Pa., miscellaneous ventilating fans. Schedule 1068, Philadelphia, 800 and 200 brass sockets and switches. Schedule 1072, Brooklyn, N. Y., 330 watertight vibrating bells, miscellaneous searchlight carbons, 2500 porcelain attachment plugs, 500 knife switches, 500 two-pole wire terminals. Schedule 1072, Boston, Mass., and Philadelphia, Pa., 400 pounds of grade A1 uncut mica. Schedule 1072, Boston, 520 rolls of white muslin tape. Schedule 1078, Puget Sound, Wash., 8 watertight type B annunciators, 72 vibrating bells, 75 push buttons, 50 firing buzzers, 1000 interior fittings, 25 watertight telephone jacks, 1900 lamp sockets for instruments, and 145 spools of silk insulating tape. Schedule 1078, Mare Island, Cal., miscellaneous receptacle clusters, three masthead lenses, 1600 non-watertight attachment plugs, 180 fire-control telephone plugs, 250 commercial chain-pull sockets and miscellaneous baby knife-switches. Schedule 1078, Mare Island and Puget Sound, 4200 portable non-watertight guards. Bidders desiring to submit proposals should make application to the bureau or to the nearest navy yard purchasing office.

INCORPORATIONS

CHICAGO, ILL.—The Chicago Telephone Company has increased its capital stock from $30,000,000 to $40,000,000.

DETROIT, MICH.—The Michigan Storage Battery Company has increased its capital stock from $50,000 to $100,000.

ST. LOUIS, MO.—The Wagner Electric Manufacturing Company has increased its capital stock from $2,000,000 to $5,000,000.

CHICAGO, ILL.—Louisville Battery Service Company. Capital, $2,500. Incorporators: Ward S. Perry, D. P. Perry and F. J. Freitag.

CHESTER, PA.—Buck & Lamnot Company. Capital, $15,000. To manufacture electric fixtures. William T. Buck, principal incorporator.

QUEEN, PA.—Equitable Light, Heat & Power Company. To operate a local light and power system. D. E. Brumbaugh, Claysburg, treasurer.

SEATTLE, WASH.—Skykomish Power Company. Capital, $1,000,000. Incorporators: George H. Tilden, H. W. Bunker and William H. Wynn, Jr.

BUFFALO, N. Y.—The Perfect Fuse Company. Capital, $10,000. General electrical work. Incorporators: W. N. Pierce, Bertram C. Candee and Frank Moeser.

MASSILLON, O.—J. C. Lewis Electric Company. Capital, $15,000. Incorporators: Joseph C. Lewis, David D. Lewis, D. D. Lewis, J. M. Lewis and A. Dornberger.

NEW YORK, N. Y.—Lanton Adams Electric Company. Capital, $10,000. Electrical machinery. Incorporators: E. Schuster, S. Hess and R. A. Lan, 315 West Ninety-fourth Street.

HIGHLAND, N. Y.—Acme Storage Battery Corporation. Capital, $100,000. To manufacture storage batteries. Incorporators: J. Phillips, F. F. Simpson and G. Kaehler, 246 West Fifty-second Street, New York.

FINANCIAL NOTES

The American Power & Light Company and local Omaha interests have acquired all the common stock of the Omaha Electric Light & Power Company.

The Public Service Electric Company of New Jersey filed a certificate showing that it has increased its capital stock from $30,000,000 to $50,000,000. The new stock will be issued at $100 par value per share.

For the year ended December 31, 1917, net profits of the Allis-Chambers Company amounted to $3,165,020, or equal to about 12.17 per cent on the $26,000,000 issue of common stock. This is an increase of $2,086,668, as compared with the previous year.

Plans have been completed for the merger of the West Penn Traction Company and the West Penn Railways Company, two of the electric railway subsidiaries of the West Penn Traction & Water Power Company, controlled by the American Water Works & Electric Company.

An increase in net earnings of nearly 13 per cent is reported for the Northern States Power Company for the year ended March 31, 1917, over the corresponding previous year. The gross earnings for 1917 were $6,353,050, an increase of $964,060, and net earnings were $3,396,051, an increase of $390,349.

The California Railroad Commission has authorized the San Joaquin Light & Power Company to execute a trust agreement with the Security Trust & Savings Bank of Los Angeles, securing $4,500,000 of six-per-cent, ten-year debentures, and to sell now at not less than 95 per cent of face value $1,000,000 worth.

At the annual meeting of stockholders of the Middle West Utilities Company on June 20, it is probable the authorized capital stock will be increased from $12,000,000 to $20,000,000 in the case of both the common and preferred issue.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate Per cent.	Bid Apr. 30.	Bid May 7
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	..	23½	23½
Adirondack Electric Power of Glens Falls, preferred	6	78½	78½
American Gas & Electric of New York, common	10+extra	128	128
American Gas & Electric of New York, preferred	6	49½	49½
American Light & Traction of New York, common	..	330	320
American Light & Traction of New York, preferred	6	112	112
American Power & Light of New York, common	4	78	75
American Power & Light of New York, preferred	6	88½	88½
American Public Utilities of Grand Rapids, common	..	35	33
American Public Utilities of Grand Rapids, preferred	6	68	66
American Telephone & Telegraph of New York	..	124	122¾
American Water Works & Elec. of New York, common	..	9½	8½
American Water Works & Elec. of New York, particip.	7	29	28
American Water Works & Elec. of New York, first preferred	..	81	81½
Appalachian Power of Bluefield, common	..	5	5
Appalachian Power of Bluefield, preferred	7	35	35
City service of New York, common	6+extra	284	279
City Service of New York, preferred	6	84	87
Commonwealth Edison of Chicago	8	131	127½
Comm. Power, Railway & Light of Jackson, common	4	53	51
Comm. Power, Railway & Light of Jackson, preferred	6	76	74
Federal Light & Traction of New York, common	..	11½	11
Federal Light & Traction of New York, preferred	..	45	42
Illinois Northern Utilities of Dixon	6	81	81
Middle West Utilities of Chicago, common	2+2 extra	53	50
Middle West Utilities of Chicago, preferred	6	71½	71
Northern States Power of Chicago, common	7	96	94½
Northern States Power of Chicago, preferred	7	98	98½
Pacific Gas & Electric of San Francisco, common	5	60	59¾
Pacific Gas & Electric of San Francisco, preferred	6	91½	91¼
Public Service of Northern Illinois, Chicago, common	7	103	98½
Public Service of Northern Illinois, Chicago, preferred	6	99	100
Republic Railway & Light of Youngstown, common	4	36½	36
Republic Railway & Light of Youngstown, preferred	6	67	67
Standard Gas & Electric of Chicago, common	..	12	11
Standard Gas & Electric of Chicago, preferred	6	37	36½
Tennessee Railway, Light & Power of Chattanooga, common	..	6½	7
Tennessee Railway, Light & Power of Chattanooga, preferred	6	29	26
United Light & Railways of Grand Rapids, common	4	41	40
United Light & Railways of Grand Rapids, preferred	6	71	72
Western Power of San Francisco, common	..	15	14
Western Power of San Francisco, preferred	6	54	54
Western Union Telegraph of New York	5+extra	95½	94¾
Industrials—			
Electric Storage Battery of Philadelphia, common	4	61¼	59
General Electric of Schenectady	8	163¾	158
National Carbon of Cleveland, common	8	*311	*75½
National Carbon of Cleveland, preferred	7	*133	*133
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	48¾	47½
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	*65	64

*Last sale.

The stock will be issued from time to time as funds may be needed.

A gain of $948,749.91 in operating revenues and a gain of $172,549.79 in net income during the year ended March 31, 1917, as compared with the preceding year, is shown by the comparative income statement accompanying recent dividend payments by the Milwaukee Electric Railway & Light Company.

Three Bylesby properties have put through new financing of late. The Western States Gas & Electric Company, which issued $1,564,000 six-per-cent gold notes, disposed of the entire amount in a few days, and an issue of $219,000 seven-per-cent preferred stock of the San Diego Consolidated Gas & Electric Company was taken up by 113 local investors. The Northern States Power Company has offered $1,500,000 new seven-per-cent preferred to its shareholders, and a syndicate has arranged to take any part of the issue which may not be taken by stockholders.

Reports of Earnings.

NORTHERN STATES POWER.

Northern States Power Company reported earnings for the 12 months ended March 31, 1917, as follows:

	1917.	1916.
Gross earnings	$6,353,050	$5,388,444
Net after taxes	3,396,051	3,005,702
Surplus after charges	1,775,150	.....
Balance after preferred dividends	968,065	.....

Based on the operating results for the 12 months, there was a balance, after payment of all preferred dividends and of the common dividends at a rate of seven per cent per annum, of $536,165 available for depreciation and amortization of bond and note discount.

AMERICAN LIGHT & TRACTION.

The American Light & Traction Company has issued a comparative earnings report for the years ending March 31, 1916 and 1917, as follows:

	1917.	1916.
Gross earnings	$ 5,757,391	$ 5,441,626
Expenses	268,494	169,519
Net earnings	5,488,896	5,272,106
Preferred dividends.	854,172	854,172
Balance for common	4,634,724	4,417,934
Total common dividends	3,683,385	3,346,760
Surplus	941,339	1,071,174
Previous surplus	11,161,293	10,090,118
Total surplus	12,102,632	11,161,292

Electrical Patents Issued May 1, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,224,126. **Centrifugal Switch.** A. H. Lakken, assignor to Westinghouse Electric & Mfg. Co., Pittsburgh, Pa. Structure of device for mounting on shaft.

1,224,139. **Distributing System.** A Chernyshoff, assignor to Westinghouse Electric & Mfg. Co. Trolley system has transformer connected between trolley and track sections so as to limit the potential across the track insulating points.

1,224,140. **Automatic Testing System.** H. P. Clausen, assignor to Western Electric Co. For determining and recording unstandard conditions in automatic telephone exchange.

1,224,143. **System of Electrical Distribution.** F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Manner of connecting work circuits to and limiting the current in a supply circuit.

1,224,147. **Electric Pump-Governor.** P. L. Crittenden, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Structure of pressure-operated switch for pump-motor circuits.

1,224,149. **Transformer.** W. M. Dann, assignor to Westinghouse Electric & Mfg. Co. Structure of end-frame for core.

1,224,150. **Arc-Suppressing Device.** D. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Structure of fluid-cooled, arc-disrupting horn.

1,224,160. **Direct-Current Apparatus.** C. W. Girvin, assignor to Girvin Electrical Development Co., Honolulu, Hawaii. Armature winding.

1,224,161. **Telephone-Exchange System.** C. L. Goodrum, assignor to Western Electric Co. Automatic.

1,224,162. **Lighting Fixture.** L. E. Griswold, assignor to Macbeth-Evans Glass Co., Pittsburgh, Pa. Structure of hanging bell and globe inclosing incandescent lamp.

1,224,166. **Control System for Single-Phase Motors.** R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. Apparatus for automatically accelerating a machine of commutator type and maintaining good commutation.

1,224,167. **Control System.** R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. Modification of above.

1,224,171. **Electrodynamometer Instrument.** J. T. Irwin, London, England. Coil arrangement.

1,224,172. **Protective Means for an Electrical Distributing System.** R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Spark-gap members of high fusibility have arcing surfaces of low fusibility.

1,224,178 and 1,224,179. **Lamp.** E. A. Kuen, assignor to Corcoran-Victor Co., Cincinnati, O. Structure of headlight.

1,224,184. **Transformer Insulation.** W. M. McConahey, assignor to Westinghouse Electric & Mfg. Co. For windings comprising high-tension coils and inner and outer low-tension coils.

1,224,185. **Telephone Signal and Recorder.** F. J. McGowen and K. W. Thalhammer, Los Angeles, Cal., assignors of five-twelfths to said McGowen, one-fourth to said Thalhammer, and one-third to I. R. Forbes, Los Angeles, Cal. Arrangement of call signals and phonographic recorder.

1,224,186. **Circuit-Interrupter.** J. N. Mahoney, assignor to Westinghouse Electric & Mfg. Co. Structure of contact device.

1,224,187. **Telegraphic Transmitter.** H. J. Mahoney, Green Bay, Wis. Has pendulum arrangement for automatically sending dots.

1,224,189. **Lamp.** G. K. Maltry, New York, N. Y. Arrangement of reflectors, etc., for concentrating light on several pieces of work.

1,224,206. **Commutator-Cylinder for Dynamoelectric Machines.** W. S. Pyrah, assignor to Westinghouse Electric & Mfg. Co. Details of construction.

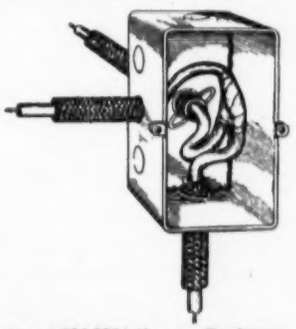
1,224,210. **Transformer-Core Punching.** E. G. Reed, assignor to Westinghouse Electric & Mfg. Co. Details of structure and assembly.

1,224,214. **Contact Apparatus for the Electrical Connection of Magnetos.** E. J. J. Salmson, assignor to Societe Des Moteurs Salmson, Billancourt, France. Collector ring, etc.; connections with armature.

1,224,216. **Control System for Pantograph Trolleys.** W. Schaake and A. H. Candee, assignors to Westinghouse Electric & Mfg. Co. Electropneumatic.

1,224,222. **Electric Switch.** L. B. Sears, Corry, Pa. Interlocking push-button switches for controlling two conductors.

1,224,225. **Transformer.** F. Sieber, assignor to Westinghouse Electric & Mfg. Co. Manner of supporting and bracing coils.



No. 1,224,227.—Loom Fastener.

1,224,227. **Loom Fastener.** E. S. Snover, Toledo, O. Looped wire for securing loom conduit to junction box. (See cut.)

1,224,242. **Process for Producing Homogeneous Articles of Any Desired Form Out of Pure Tungsten.** O. Voigtlander, Essen-on-the-Ruhr, Germany. Metallic tungsten is produced by reacting on an oxid with metallic aluminum under special conditions.

1,224,244, 1,224,245 and 1,224,247. **Magneto.** G. W. Wacker, Rutherford, N. J. assignor to Auto-Ped Co. of America. First patent: arrangement of spark coil on armature. Second patent: structure of interrupter. Third patent: modification of No. 1,224,244.

1,224,246. **High-Tension Coil.** G. W. Wacker, assignor to Auto-Ped Co. of America. Details of construction of winding, insulation, etc.

1,224,253. **Illuminated Sign.** R. R. Wiley and W. K. Wiley, Buffalo, N. Y., and W. S. Hough, Jr., St. Catherines, Ontario, Canada. Details of electrically illuminated double-face sign.

1,224,255. **Transforming System.** V. E. Alden, assignor to Westinghouse Electric & Mfg. Co. For transforming between two-phase and three-phase.

1,224,259. **Insulator.** F. Bement and E. A. Logan, Shrewsbury, Mass. Structure of split tubular member for receiving an insulated wire.

1,224,260. **Oil-Deflector.** C. O. Bergstrom, assignor to B. F. Sturtevant Co., Boston, Mass. For shafts of dynamo-electric machines.

1,224,269. **Fitting for Electrical Conduit-Systems.** D. L. J. Broadbent, Southport, England. Elbow or "T" has special provision for securing it to conduit end.

1,224,296 and 1,224,299. **Ignition Device.** L. H. Gibson, assignor to Gibson-Hollister Mfg. Co., Boston, Mass. Structures of spark plugs.

1,224,307. **Arc-Welding Apparatus.** J. F. Lincoln, Cleveland, O. Differential field of generator is controlled by series solenoid.

1,224,315. **Wire-Trench and Picture Molding.** O. M. Otte, Jamestown, N. Y. Sheet-metal structure.

1,224,316. **Means for Attaching Electrical Appliances to Conduit Outlet-Boxes.** J. E. Parker and D. B. Winter, assignors to Crouse-Hinds Co., Syracuse, N. Y. Has adjustable nuts for securing fastening screws of appliances, which are different distances apart.

1,224,320. **Terminal Fitting for Electric Conduits.** J. C. Phelps, Springfield, Mass. Structure of cap for conduit end, permitting passage of wires.

1,224,321. **Detector of Combustible Gases.** A. Philip and L. J. Steele, Portsmouth, England. A catalytic detector affects a wheatstone bridge.

1,224,324. **Telephone Bracket.** H. B. Roberts, Highland Park, Ill. Lazy-tongs extension for receiver support.

1,224,330. **Safety Device for Electrical Systems.** L. Siebenhauer, assignor to Drendell Electrical & Mfg. Co., San Francisco, Cal. For controlling the distribution of power from a feed wire.

1,224,332. **Electrical Protective Device.** B. H. Smith, assignor to Westinghouse Electric & Mfg. Co. Wheatstone bridge is unbalanced by heating effect of current through protected device.

1,224,337. **Switch.** H. A. Steen, assignor to Allis-Chalmers Mfg. Co. Oil switch of drum type.

1,224,342. **Multiplex Telegraphy.** F. K. Vreeland, assignor to Vreeland Apparatus Co., New York, N. Y. Utilizes alternating currents of different frequencies.

1,224,343. **Wireless Telegraphy.** J. O. Watkins, assignor to Federal Telegraph Co., San Francisco, Cal. Comprises a contact between a smooth rotating disk and a stretched wire with means for varying the wire tension.

1,224,347. **Corn-Popping Machine.** I. T. Wolfe, Seattle, Wash. Electrically heated and has electromagnetically controlled supply.

1,224,356. **Ignition Control.** W. C. Brown, assignor to Humphrey Gas Pump Co. Interrupter contacts are operated by a reciprocating liquid column.

1,224,359. **Contact Arrangement for Call-Boxes and Other Transmitters.** A. A. Clokey, assignor to Western Union Telegraph Co., New York, N. Y. Structure of device having toothed, grounded break-wheel operating contact pens.

1,224,365. **Combined Support and Circuit-Breaker for Conductors.** J. P. De-

ranek, East St. Louis, Ill. For trolley wires.

1,224,370. Electrical Protective Device. C. LeG. Fortesque, assignor to Westinghouse Electric & Mfg. Co. Circuit-breaker relay has winding across the protected device, and a current winding receiving energy when the current and temperature of the device exceeds predetermined values.

1,224,374. Two-Way, Two-Wire Trunk for Multioffice Automatic Exchange Systems. C. L. Goodrum, assignor to Western Electric Co. Circuit arrangements of a repeating trunk between two central offices.

1,224,376. Battery. C. Hambuechen, assignor to American Carbon & Battery Co., East St. Louis, Ill. Details of unitary structure comprising a number of dry cells.

1,224,386. Means for Indicating Abnormal Temperatures in Vegetable Matter. A. D. Kennedy, assignor of one-half to American Machine & Mfg. Co., Greenville, S. C. Comprises a thermostat on a long handle, so that it can be thrust into a pile of material, and electrical indicators controlled thereby.

1,224,386. Lighting Appliance. L. Langner, New York, N. Y. Structure of semi-indirect device.

1,224,400. Electrical Protective Device. P. MacGahan, assignor to Westinghouse Electric & Mfg. Co. Circuit-breaker is responsive to current and temperature of protected device.

1,224,408. Electrical Protective Device. L. M. Perkins, assignor to Westinghouse Electric & Mfg. Co. Reverse-current relay responsive to potential and current proportional to the ratio of the energy losses in a fixed resistance and the protected device.

1,224 409. Barrier Cut-out Switch. J. C. Phelps, assignor of one-half to H. H. Curtis, Springfield, Mass. Structure of unit fuse-block.

1,224,420. Synchronizer. M. L. Severy, and G. B. Sinclair, assignors to Choralcelo Co., Boston, Mass. For driving and driven devices; latter has electrically controlled speed mechanism.

1,224,421. Headlight. F. D. Shenk, Medford, and R. H. Holman, Stoneham, Mass. Structure of refractive screen.

1,224,425. Telephone System. Le R. W. Stanton, Davenport, Iowa. Arrangement of party line.

1,224,434. Storage Battery. T. A. Willard, assignor to Willard Storage Battery Co., Cleveland, O. Structure of box for containing jars.

1,224,439. Shock-Absorber for Batteries. F. N. Bosson, Calumet, Mich., and L. B. Armstrong, Milwaukee, Wis. Container has nested cellular units comprising rubber jars.

1,224,455. Primary Battery. G. S. Engle, Cranston, R. I. Has copper container and negative of copper oxids with zinc element between container and negative element, and an alkaline electrolyte.

1,224,471. Hammer. G. L. Kollock and R. P. Martin, assignors to Universal Hammer Co., Seattle, Wash. Portable, unitary structure in which striker is reciprocated by spring and motor-operated cam.

1,224,499. Radio Telegraphy and Telephony Receiver. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., Boston, Mass. Receiving circuit comprises combination of one coil of natural period equal to shortest desired wave length and another coil having a much shorter period.

1,224,505. Attachment Plug. R. A. Schoenberg, New York, N. Y. A flanged shell is secured to a formed cap of insulating sheet material.

1,224,508. Control Mechanism for Sewing-Machine Motors. H. E. Sellers, assignor to Marathon Electric Mfg. Co., Wausau, Wis. Special structure of treadle-controlled rheostat.

1,224,517. Switching Device. A. H. Weiss, assignor to Kellogg Switchboard Supply Co., Chicago, Ill. Structural details of device for telephone systems.

1,224,518. Armature Construction for Dynamoelectric Machines. V. G. Apple, Dayton. Method of winding a core having axially extending openings.

1,224,535. Magneto. P. Hamm, Milwaukee, Wis. Has stationary armature and rotatable permanent magnets operating interrupter.

1,224,542. Circuit-Controller. W. S. Henry, assignor to General Railway Signal Co., Gates, N. Y. Details of switch mechanism of drum type.

1,224,570. Interrupter. S. Sandreuter, Stamford, Conn. Rotating disk having periphery of alternating conducting and insulating sections and a rolling contact spring pressed there against.

1,224,580. Ore-Separating Machine. H. H. Thompson, Aldrige, and A. E. Davies, Hockley Heath, England. Has a preliminary separating disk armature for removing more highly magnetic particles and main disk armature for effecting main separation of material carried on a belt.

1,224,602. Electrical Apparatus. A. Churchward, assignor to A-B-C Starter Co., Detroit, Mich. Has special provision for positioning end heads of motor frames.

1,224,610. Rheostat. M. S. Cumner and F. W. Geissenhainer, assignors to Nestor Mfg. Co., New York, N. Y. Structure and mounting of contacts and resistor units.

1,224,632. Traffic-Signal. W. Ghiglieri, San Francisco, Cal. Electrically operated at will or automatically at intervals.

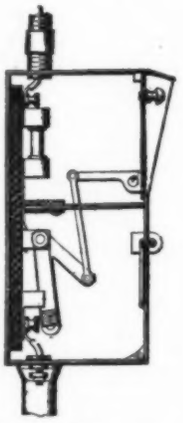
1,224,639. Apparatus for Transforming Electrical Energy. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Mercury vapor device.

1,224,640. Telegraph System. R. Hitchcock, New York, N. Y. Of the type which depends for selective action upon driving apparatus at each station at exactly a fixed speed.

1,224,652. Electric Jack. H. Kocourek, assignor to Stewart-Warner Speedometer Corp., Chicago, Ill. Comprises special limit-switch.

1,224,657. Direction-Indicator for Automobiles. R. J. Miller and J. Bell, Bremerton, Wash. Electrically operated and illuminated to project signals from opposite sides.

1,224,663. Projection Apparatus and Illumination System Therefor. W. L. Patterson, assignor to Bausch & Lomb Optical Co., Rochester, N. Y. Arrangement of lamp and reflectors for projecting an object by reflection.



No. 1,224,881.—Electric Switch and Fuse Box.

1,224,689. System of Electrical Distribution. P. H. Thomas, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Comprising vapor rectifiers.

1,224,695. Signal. C. Willers, Chicago, Ill. Electrically illuminated signal casing and license plate for automobiles.

1,224,701. Multiple-Anode Mercury-Vapor Apparatus. J. R. Baker, assignor to Cooper-Hewitt Electric Co. Relates to distribution of the current.

1,224,703. Method of Dehydrating and Curing Tobacco. G. H. Benjamin, New York, N. Y. Comprises subjecting it to rays of electric light to develop color and aroma.

1,224,707. Speedometer. A. A. Canton, New York, N. Y., assignor to Device Testing Co. Indicator element is balanced between solenoid of fixed strength and solenoid intermittently energized with a frequency dependent on the speed.

1,224,729. Rotary Converter. L. Fleischmann, assignor to General Electric Co., Schnectady, N. Y. Method of starting.

1,224,739. Electrical System. H. H. Gordon, Washington, D. C. High-tension ignition device for combustion engines.

1,224,741. Indicator for Fluid Containers. G. P. Hewis, Regina, Saskatchewan, Canada. Float-controlled electric circuit for gasoline tanks, etc.

1,224,783. Automatic Musical Instrument. F. A. Pilcher, assignor of one-third to M. C. Beman and one-third to F. Beman, Binghamton, N. Y. Electropneumatic.

1,224,788. Process of Securing Combustible Fluids from Carbonaceous Solids. J. H. Reid, assignor to Patents Process Co. Electricity is passed through charcoal with which treated material is associated.

1,224,827. Controller for Indicating Systems. A. Zeisel, assignor to Zeisel Electric Co., Bel Air, Md. Structure of resistance device with rocking handle.

1,224,856. Electrical Connection. W. A. Chryst, assignor to Dayton Engineering Laboratories Co., Dayton, O. Pig-tail connection for brushes of dynamos.

1,224,864. Portable Electric Lamp Holder. C. Carson, assignor to H. W. Johns-Manville Co. For attachment to dry battery.

1,224,880 and 1,224,881. Electric Switch and Fuse Box. L. F. Kries, assignor to C. M. Marshall, trustee, Baltimore, Md. Door affording access to live parts controls switch. (See cut.)

1,224,883. Telephone Supervisory System. C. Mollerup, assignor to Automatic Electric Co., Chicago, Ill. For system comprising local battery manual lines and common battery automatic lines.

Reissue 14,296. Planer and System of Motor Control Therefor. W. T. Sears, Philadelphia, Pa., and S. H. Keeper, deceased, Plainfield, N. J., by Niles-Bement-Pond Co., Jersey City, N. J., assignee. Automatic control of motor driving table and motor feeding tool.

PATENTS EXPIRED.

The following United States electrical patents expired on May 8, 1917:

648,919. Electric-Telegraph Apparatus for Use on Cable or Other Lines. S. G. Brown, Bournemouth, England.

648,939. Electric Circuit-Closer. H. H. Fowler and W. F. Pack, Waverly, Tenn.

648,951. Electric Switch. A. Hanson, Chicago, Ill.

648,977. Signal for Selective Calling Appliances. F. R. McBerty, Evanston, Ill.

648,978. Signaling Apparatus for Telephone Lines. F. R. McBerty, Evanston, Ill.

648,995. Electric-Train System. W. B. Potter, Schenectady, N. Y.

649,003. Envelope for Storage Batteries. E. A. Sperry, Cleveland, O.

649,006. Alternating-Current Motive Apparatus. C. P. Steinmetz, Schenectady, N. Y.

649,007 and 649,008. Frequency Indicator. C. P. Steinmetz, Schenectady, N. Y.

649,015. Current Interrupter. E. Thompson, Swampscott, and R. Shand, Lynn, Mass.

649,031. Electromagnet. S. M. Young, New York, N. Y.

649,057. Governor for Explosive Engines. C. M. Johnson, New York, N. Y.

649,068. Spring-Jack for Telephone Switchboards. F. McBerty, Downers Grove, Ill.

649,069. Supervisory Signal for Telephone Lines. F. R. McBerty, Evanston, Chicago, Ill.

649,076. Supervisory Signal for Telephone Switchboards. C. E. Scribner, cago, Ill.

649,077. Station Appliance for Telephone Toll Lines. C. E. Scribner, Chi-

649,078. Signal for Telephone Trunk Lines. C. E. Scribner, Chicago, Ill.

649,086. Electromagnetic Coil. R. Varley, Jersey City, N. J.

649,102. Telegraphic Receiving Instrument. N. Flechtenmacher, Bucharest, Roumania.

649,105. Apparatus for Electric Lighting, Etc. O. P. Loomis, Depew, N. Y.

649,138. Electromechanical Typewriting System of Intercommunication. A. D. Neal, Boston, and H. F. Eaton, Quincy, Mass.

649,179. Transformer Secondary. A. F. Reitzel, Lynn, Mass.

649,182. Apparatus for Producing Radiation and Light by Electricity. C. H. Stearn and C. F. Topham, London, England.

649,199. Electric Switch. W. Ely, Providence, R. I.

649,235. Trolley Wheel. J. A. Collins, Cincinnati, O.

649,250. Marine Electric-Light Fixture. G. L. Martin, New York, N. Y.

649,262. Elevator. O. F. Shepard, Jr., Madeira, O.

649,264. Electric Bell-Striking Apparatus. L. D. Tillyer and E. D. Tillyer, Dover, N. J.

649,295. Accumulator. L. G. Farcia, Aspe, Spain.

649,308. Incandescent-Lamp Socket. H. Hubbell, Bridgeport, Conn.

649,349 and 649,350. Galvanic Battery. C. M. Platt, Waterbury, Conn.